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SMART (HELEN F.). **Types and survival of some microörganisms in frozen-pack Peas, Beans, and Sweet Corn grown in the east.**—*Food Res.*, ii, 6, pp. 515–528, 1937.

The writer discusses and tabulates the data resulting from a microbiological examination of fresh and frozen samples from the Arlington Experiment Farm, Rosslyn, Virginia, of 14 varieties of green and wax beans [*Phaseolus vulgaris*], 35 of maize (sweet corn), and 8 of Lima beans [*P. lunatus*], as well as of 18 pea varieties in the frozen state only [cf. *R.A.M.*, xvii, p. 538]. The predominating moulds isolated from fresh beans were *Cladosporium* and *Penicillium* spp., *Monilia* and *Rhizopus* spp., however, also being present. Two yeasts, a red torula and *Endomyces* sp. (the latter predominating), were also isolated from this material. A species of *Monilia* was the principal organism found in frozen bean samples, from which species of *Cladosporium* and *Endomyces* had apparently been eliminated. Fresh sweet corn yielded species of *Monilia*, *Oidium* [*Oospora*], *Fusarium*, *Penicillium*, and *Rhizopus*, the two first-named predominating, as they do also in the frozen material from which *Fusarium* was absent. The predominating yeast in these samples, both fresh and frozen, was a *Saccharomyces*. Species of *Dematium*, *Penicillium*, *Cladosporium*, and *Monilia* were isolated from fresh Lima bean samples, the two first-named predominating; *Cladosporium* was absent from frozen material, which yielded chiefly *Monilia*. A red and a brown torula, and species of *Saccharomyces*, *Aspergillus*, *Monilia*, and *Penicillium* occurred in profusion in frozen peas, which also contained *Rhizopus*. The pre-treatment of scalding the vegetables and freezing and storage at −17·8° C. (0° F.) for five to seven months reduced the average microbial content of green and Lima beans and sweet corn by 99·8, 97·2, and 94·6 per cent., respectively, but nevertheless some of the sweet corn packs still yielded up to 1,000,000 per gm., chiefly soil types which succumbed to scalding in the case of the vegetables.

WILSON (R. D.). **A selective medium for Bacterium medicaginis var. phaseolicola (Burkholder) Link and Hull.**—*J. Aust. Inst. agric. Sci.*, iv, 1, pp. 47–49, 1938.

A selective medium evolved by the author for the detection of bean [*Phaseolus vulgaris*] seed infection by *Bacterium medicaginis* var. *phaseolicola* [*R.A.M.*, xvi, pp. 150, 441, 728; xvii, p. 369] as well as for the isolation of the bacterium from soil and other sources, consists of

sodium taurocholate 15 gm., glycerol 30 gm., ammonium nitrate 10 gm., water 1,000 ml., gentian violet 0·02 (for a solid medium) to 0·2 gm. (for a liquid medium), and agar (for a solid medium) 15 to 17 gm. The seeds are placed in tubes or flasks containing the medium kept at about 25° C. After two days a loopful is transferred with a sterile needle to tubes of beef extract-peptone broth. After a further two days, inoculations are made from the broth tubes showing turbidity into pieces of fresh bean pods placed in Petri dishes. Pod infection in two to five days indicates that the seed is infected.

Certain bacterial saprophytes carried with the seed are able to grow in the selective medium and may prevent infection when the pod inoculations are made. Very light seed infection therefore is not always revealed by this method, which will, however, detect it when the direct inoculation of 6- to 24-hour-old water infusions of bean seeds into pods fails to do so.

Wilson (R. D.). **Occurrence of Bacterium syringae (Van Hall) E. F. Smith on French Beans (Phaseolus vulgaris L.) in New South Wales.**—*J. Aust. Inst. agric. Sci.*, iv, 1, pp. 42–43, 1 fig., 1938.

In 1936 and 1937 isolations from leaves of French beans (*Phaseolus vulgaris*) collected from several localities in New South Wales yielded an organism the cultural, biochemical, and physiological characters of which agreed generally with those of *Bacterium* [*Pseudomonas*] *syringae* [*R.A.M.*, ix, p. 695; xiv, p. 16; xv, p. 678; xvi, pp. 157, 329], while all the isolates fermented raffinose as rapidly as did cultures of *P. syringae* from citrus.

The affected leaves bore reddish-brown lesions with very little yellowing of the surrounding tissue, and the symptoms could not be confused with those of halo spot (*Bacterium medicaginis* var. *phaseolicola*) [see preceding abstract] except under dry conditions. Affected pods were noted in one crop, the lesions in this case being brown, sunken, rather less than 5 mm. in diameter, and closely similar to lesions resulting from needle-puncture inoculations of pods with pure cultures of *P. syringae.*

All the isolates made abundant white growth on beef extract-peptone agar slopes, produced a brown, sunken, necrotic lesion when inoculated with needle-pricks into French bean pods, and were pathogenic when needle-puncture inoculations were made in the stems of young French bean, cowpea, and snake bean (*Vigna sesquipedalis*) seedlings. When young seedlings of Tweed Wonder and Red Kidney beans were inoculated with any of the isolates by needle-puncture of the stem at the cotyledon node the plants wilted and generally collapsed above the point of inoculation in two to four days. Cultures reisolated from the inoculated plants were identical with the original isolates.

Loring (H. S.), Osborn (H. T.), & Wyckoff (R. W. G.). **Ultracentrifugal isolation of high molecular weight proteins from Broad Bean and Pea plants.**—*Proc. Soc. exp. Biol., N.Y.*, xxxviii, 2, pp. 239–241, 1938.

When the juice from *Vicia faba* plants infected with pea mosaic (pea virus 1) [*R.A.M.*, xvii, p. 91] was ultracentrifuged [cf. ibid., xvii,

p. 207] in a field of 40,000 g. for 1½ hours, appreciable amounts of heavy material were obtained, the pellets being two or three times as large as those found in the latent mosaic virus. After three ultracentrifugations, a solution of the pellets in water gave the usual qualitative tests for protein and the kind of absorption diagram in the analytical ultracentrifuge that is typical of purified heavy proteins. Almost all the light 'unsedimentable' proteins were eliminated, and sharp boundaries were noted, characterized by the sedimentation constants $S_{20} = 76 \times 10^{-3}$ cm. sec^{-1} $dynes^{-1}$ and $S_{20} = 112 \times 10^{-13}$. Some samples gave a third boundary with $S_{20} = 54 \times 10^{-13}$.

The results of inoculation trials demonstrated some concentration of the virus in the sedimented pellets. The low specific activity of the sedimented protein indicated that it was not a pure virus protein, which was confirmed when ultracentrifugation of the juice from healthy broad bean yielded a similar non-infectious heavy protein with sedimentation constants similar to those from the infectious solution. Thus, either the concentration of the virus principle in the final solutions was too low to permit detection with the analytical ultracentrifuge, or else the virus had the same sedimentation constant as one of the normal constituents.

A purified protein, probably a nucleoprotein, giving sharp boundaries with $S_{20} = 77 \times 10^{-13}$, $S_{20} = 117 \times 10^{-13}$, and sometimes $S_{20} = 54 \times 10^{-13}$ was obtained from the juice of healthy peas (*Pisum sativum* var. *arvense*). Both the broad bean and pea proteins were pigmented (dark and light green, respectively) and of limited stability.

Similar procedures did not give homogeneous macromolecules from the juice of healthy tobacco plants; if such proteins exist, they are either very unstable or present only in very small amounts.

HASHIOKA (Y.). **The mode of infection by Sphaerotheca fuliginea (Schlecht.) Poll. in susceptible, resistant and immune plants.**— *Trans. nat. Hist. Soc. Formosa*, xxviii, pp. 47–60, 3 figs., 1938.

Continuing his studies on cucurbit wilt in Japan, the author carried out a series of experiments to determine the mode of penetration of the causal organism, *Sphaerotheca* [*humuli* var.] *fuliginea* [*R.A.M.*, xvii, p. 93], into susceptible, resistant, and immune plants.

The test plants of the first-named category were cucumber, watermelon, *Cucurbita melo* var. *conomon* f. *albus*, and *C. moschata* var. *toonas*. On cucumber cotyledons the germ-tubes arising from the conidia of the fungus usually attain a length of 20 to 40 μ within 15 hours, and about 5 hours later an infection hypha enters the host through the cell membrane of the epidermis. During its passage through the cellulose layer the infection hypha becomes enveloped in a papillate local thickening (Corner's 'infection papilla') [ibid., xiv, p. 711] directed towards the interior and giving rise on maturity to a slender hypha which continues to develop in the host cytoplasm, producing an absorbing vesicle at the apex. This vesicle gradually assumes an elongated-ellipsoid form and attains dimensions of 9 to 16 by 5·5 to 7·5 μ. At the same time the infection hypha extends to a length of 5 to 8·5 μ and forms the stalk of a haustorium. At this stage or a little later, a hyaline, very thin membrane, originating at the joint of the stalk, begins to encircle the vesicle, which is ultimately enclosed in a membranous sheath. At

maturity the haustoria are of an apple-like shape and measure 15 to 22 by 12 to 19 μ.

Beans (*Phaseolus vulgaris*), *Ricinus communis*, *Impatiens balsamina*, and *Petunia violacea* comprised the resistant group. Germ-tube development on the leaves of the two last-named (the most resistant) was somewhat less extensive than in the relatively more susceptible bean and *R. communis*. The plants of this group (except *P. violacea*) reacted to infection by a brown discoloration of the cells, which also involved the invading haustorium, while the sheath enveloping the haustorial vesicle in susceptible hosts is absent or poorly developed in resistant ones. In the case of the comparatively susceptible beans some of the haustoria are normally formed while others are disorganized; in *R. communis* haustorial production is scanty, the proportion of discoloration is high, and the presence of numerous infection papillae, up to 9 μ in length, serves to prevent the intrusion of infection hyphae into the host cytoplasm. Similar features are characteristic of *I. balsamina* and *P. violacea*.

The immune category falls into two sections, (1) subinfection and (2) negative infection, which in turn are subdivided into A and B. Section 1A, in which hyphal growth persists for a time, consisted of *Bryophyllum pinnatum*, *Emilia sonchifolia*, *Nicotiana glauca*, and *Ageratum conyzoides*. Conidial germinability was markedly restricted on these hosts with the exception of *B. pinnatum*, which also permitted approximately normal haustorial development, and reacted to invasion by swelling and discoloration of the cellular membrane and dissolution of the epidermal cells of the palisade parenchyma. These processes were followed by disorganization of the haustoria. In the other plants of this section the hyphae and haustoria are formed and disorganized similarly to the foregoing but do not persist as long in the infected tissues as in those of *B. pinnatum*. In the case of section 1B, represented by tomato, eggplant, potato, and *Eichhornia crassipes*, the fungus dies immediately after the haustoria enter the host. On tomato the germ-tubes mostly attain a length of 25 to 40 μ and bear 1 or 2 infection papillae, but on the other hosts of this group only a single germ-tube, 30 to 40 μ in length, is produced, giving rise to one penetration hypha. All the plants show the characteristic browning and swelling of the cell walls at the site of penetration, but only in the case of tomato was cytoplasmic turbidity observed, due to the envelopment of the invading haustorium by a dark-coloured precipitate.

Section 2A comprises *Solanum nigrum*, tobacco, and broad bean (*Vicia faba*), in which penetration of the cell wall occurs but is not followed by the intrusion of the fungus into the cytoplasm. Conidial germination is fairly profuse and each germ-tube forms from 1 to 3 infection papillae on the epidermal membrane of the host, after which the development of the parasite is arrested. *S. nigrum* and broad beans show a yellowish discoloration of the affected cells. In the case of section 2B, represented by *Agave americana* var. *variegata*, *Cinnamomum camphora*, *Ficus elastica*, *Hoya carnosa*, *Rhoeo discolor*, *Tradescantia virginiana*, and *Vanilla somai*, *Sphaerotheca* [*humuli* var.] *fuliginea* appears to be unable to penetrate the very thick cuticle of the leaves.

ALEXANDRI (A. V.). **La mosaïque des feuilles de Solanum melongena L. en Roumanie.** [Mosaic of *Solanum melongena* L. leaves in Rumania.]—Reprinted from 'Hommage au Professeur E. C. Teodoresco', Bucharest, 1937, 12 pp., 1 fig., 1937. [Received May, 1938.]

Eggplant mosaic [*R.A.M.*, xv, p. 386], first observed in Rumania in 1931, is stated to have become progressively more virulent since that date, causing 50 to 60 per cent. damage in the Ilfov Department in 1934 and being detected in glasshouse plants for the first time in 1936.

Infection originates on the basal leaves, mostly of mature plants, and advances upwards, all the foliage being involved 20 to 40 days after the appearance of the initial symptoms. Affected plants develop abnormally slowly and the leaves do not attain their proper size; they are covered, moreover, with the yellow, interveinal lesions typical of mosaic infection, which expand by 1·2 mm. daily both in length and breadth. The diseased foliage rapidly shrivels and drops.

The inoculation of healthy eggplants with the filtered expressed juice of infected plants by means of a syringe or by spraying gave positive results, while detached leaves reacted to the former method only.

The virus was inactivated by exposure to a temperature of 60° C. and to 64 per cent. alcohol at 96°, but not by dilution up to 1 : 1,000. Cross-inoculation experiments with the virus on a number of other Solanaceae, including potato, *Solanum nigrum*, *Datura petaloides*, *D. stramonium*, *Nicotiana silvestris*, tobacco, *N. fragrans*, and *N. sanderae*, gave positive results. The aphid *Phorodon* [*Myzus*] *persicae* is suspected of transmitting the disease, but experimental proof has not yet been obtained.

HASSEBRAUK (K.). **Über die Eignung und Bewertung von Kupferoxychlorid als Spargelrostbekämpfungsmittel sowie einige andere Beobachtungen zum Spargelrost.** [On the suitability and value of copper oxychloride as a means of controlling Asparagus rust and some other observations.]—*Gartenbauwiss.*, xii, 1, pp. 1–16, 5 graphs, 1938.

The results of field experiments, carried out from 1934 to 1937, showed that the effect of the copper oxychloride preparation Wacker's Kupferkalk in the control of asparagus rust [*Puccinia asparagi*: *R.A.M.*, xvii, p. 429] was, contrary to the results obtained by Hülsenberg [ibid., xiv, p. 489] and Bremer [ibid., xv, p. 627], too slight and too variable to allow this treatment to be recommended. Four years' field tests on the effect of manure on the susceptibility of asparagus to rust yielded negative results. That the female plants are more readily attacked by rust is explained in the author's view by their less bushy habit, it having been observed that thickly branched plants are less susceptible to infection, whereas the fact that late shoots are more strongly attacked than the early shoots of the same plant is attributed to their physiological difference.

PORTÈRES (R.) & LEGLEU (R.). **La 'rosette' de l'Arachide. Connaissances actuelles, relations avec la date des semis dans le pays**

du Baoulé-Nord, méthodes prophylactiques à appliquer. [Groundnut rosette. Present knowledge, relationship with the sowing date in the district of Baoulé-Nord, and prophylactic methods to be applied.]—*Ann. agric. Afr. occ.*, i, 3–4, pp. 332–355, 1 map, 1937. [Received June, 1938.]

After briefly reviewing earlier work on rosette disease of groundnuts [*R.A.M.*, xvi, p. 653; xvii, p. 208], the authors give figures illustrating its prevalence in the French Ivory Coast (district of Baoulé-Nord) and state that in one typical instance the disease caused a loss of weight of 81 per cent. in the yield of fresh pods, 64 per cent. in fresh forage, and 71 per cent. in total plant weight, the weight of the fresh pods being only one-third of that of the fresh forage, though in healthy plants it was two-thirds.

Clear evidence was obtained that infection occurred most rapidly in the latest-sown fields, and that the damage caused was greatest when the plants became diseased in the early stages of growth.

Four morphologically distinct types of rosette are found locally, viz., chlorotic rosette, green rosette, rosette type 3 [ibid., xii, p. 5; xv, p. 426], and clump [ibid., xi, pp. 93, 223]. The first is extremely common, the second moderately so, the third very rare, and the fourth is only provisionally regarded as a distinct type, observations indicating that it is due to infection occurring so early that none of the plant organs has time to develop normally.

In chlorotic mosaic (Hayes' type I), the chlorotic leaves are occasionally more succulent and less pliant than normal ones, and leaf-rolling is present only as a very slight convexity of the blade. In the creeping varieties, the rosettes of those branches that have at first an erect habit spread out horizontally. When the first symptoms become evident the tips of the affected branches rise slightly. Severely affected plants produce other branches near the centre which rapidly become arrested and show a rosette formation. These branches often develop symptoms closely resembling green rosette.

The only possible local vector appears to be *Aphis laburni*, which occurs in large numbers on all groundnuts.

The control measures recommended consist in sowing during the two months following the first rains (i.e., March and April for places in the latitude of Bouaké), or even earlier where suitable, curtailing the total sowing period as much as possible, avoiding the resowing of late-sown patches that have become infected, removing and burning every diseased plant up to flowering time but not afterwards (this being uneconomic), adopting cultural practices to expedite and increase growth, maintaining an uncultivated, clean border 7 to 8 m. wide between the edge of the field and any road or path in order to avoid disturbing insects, and developing immune varieties.

Rui (D.). **Relazione su prove di lotta antiperonosporica effetuate nel 1937.** [Report on the anti-*Peronospora* control experiments conducted in 1937.]—*Ric. sci. Progr. tec. Econ. naz.*, Ser. 2, ix, 3–4, pp. 100–106, 1938.

Details are given of the writer's experiments on the control of *Plasmopara viticola* on vines at the Conegliano (Italy) Viticultural Experiment

Station in 1937 with three new liquid preparations, viz., copper oxyfluosilicate, Prodotto D'Agostino, consisting of copper sulphate, sodium hydrosulphite, and lime or gelatine (L. D'Agostino, Reggio E.), and cuprital, a blend of copper, iron, aluminium, calcium, and sodium salts (Spec. Anticritt. Naz., Turin). Of these the last-named gave the best results, approximating to those obtained in comparative tests with Bordeaux mixture and permitting a saving of some 60 per cent. of copper; it is easy to prepare and adheres well. Prodotto D'Agostino merits further trial, but copper oxyfluosilicate was ineffective.

BEAUMONT (A.) & STANILAND (L. N.). **Fourteenth Annual Report of the Department of Plant Pathology, Seale-Hayne Agricultural College, Newton Abbot, Devon, for the year ending September 30th, 1937.**—48 pp., 2 figs., 1938.

In this report, which is on the same lines as those for previous years [cf. *R.A.M.*, xvi, p. 514], it is stated that, taking the days in 1937 that had a minimum temperature of 50° F. or over and a relative humidity of not under 75 per cent. at Seale-Hayne, the only favourable date for potato blight [*Phytophthora infestans*] infection during the year was 23rd May. No disease followed, confirming previous experience that early favourable periods are not generally followed by outbreaks in Devon.

In notes on fungal diseases during the year it is stated that one case of wheat infection by *Cercosporella herpotrichoides* [ibid., xv, p. 433; xvi, p. 242] was observed. White root rot (*Rosellinia necatrix*) of potatoes [ibid., viii, p. 628] was noted for the first time in Devon. Red core of strawberry [*Phytophthora* sp. allied to *P. cinnamomi*: ibid., xvii, p. 402] occurred at four centres in the Tamar valley, two of the cases being traced to infections during the previous year [ibid., xvi, p. 515]. A new disease of bulbous iris, apparently due to a species of *Phytophthora*, was found in Scilly by G. W. Gibson, causing greyish-white, later purplish-brown lesions on the leaves. The condition, which was first observed in 1928 on the variety Imperator, was also found by P. H. Gregory on White Excelsior at Penzance. It becomes noticeable only in very wet winters.

In a few localities anemones were affected by downy mildew (*Plasmopara pygmaea*), and in west Cornwall by a rotting of the corms and leaf-stalk bases caused by a strain of *Botrytis* sp. resembling *B. cinerea*. An irregular, yellow leaf-spotting caused by *Ramularia petuniae* destroyed a large part of the foliage of petunia pot plants under glass at Plymouth; the only previous record was in 1891, also at Plymouth.

WILLIAMS (P. H.), AINSWORTH (G. C.), OYLER (ENID), WHITE (H. L.), & READ (W. H.). **Plant diseases.**—*Rep. exp. Res. Sta. Cheshunt, 1937*, pp. 42–58, 1938.

The following are among the items of interest in this report, prepared on the usual lines [*R.A.M.*, xvi, p. 726], apart from those noticed from other sources. P. H. Williams investigated a more or less superficial browning of mushroom [*Psalliota* spp.] caps apparently identical with the 'wilt' attributed by F. C. Wood to *F. oxysporum* and *F. solani* var. *martii* [ibid., xvi, p. 434], but though *Fusarium* and bacteria were

isolated, inoculation experiments were unsuccessful, and the trouble is tentatively ascribed to unfavourable conditions in the beds. *Hypomyces rosellus*, in its conidial stage *Dactylium dendroides* [ibid., xiv, p. 346; cf. xvii, p. 378] was detected, for the first time at the Station, in some of the material inspected during 1937. On the beds the fungus produces a white growth tinged with pink or purple, covering and destroying the growing mushrooms but apparently causing only gradual decay. The fungus is generally controllable by the elimination of infected material and casing soil, but in severe cases formaldehyde should be applied to the small, isolated clumps of diseased mushrooms.

Enid Oyler describes a widespread disease of chrysanthemums, due to a *Verticillium* with cultural characters reminiscent of *V. dahliae* [ibid., xiii, p. 444], which causes stunting of the plants, especially the tops, and wilting and chlorosis of the leaves from the stem base upwards. Infection may be unilateral and sometimes involves only half the leaf surface, in which case bright yellow blotches develop at the margins and spread inwards. The diseased leaves subsequently turn brown and hang down along the stem: at this stage the lesions may be differentiated from those due to eelworm [?*Aphelenchoides ritzema-bosi*] by the more diffuse appearance of the patches. A brown discoloration of the basal wood extends upwards into the branches. The fungus was isolated from the affected parts of the plants, but not from the roots. The *Verticillium* wilt, which appears towards the end of July and reaches a climax in October and November, attacks many varieties, including Ace, Balcombe Beauty, Golden Favourite, Liberty, Pink Consul, Rose Précoce, and White Favourite. Infection is spread through infected cuttings, so that suspected plants should be destroyed after flowering.

The same worker inoculated heath (*Erica hiemalis*) plants with *Phytophthora cinnamomi* [ibid., xvi, p. 465] and a second species identified by S. F. Ashby as *P. cactorum*, both of which were isolated from diseased specimens received at the Station in 1936. The former is the more virulent of the two species, giving positive results in 92 per cent. of the tests as compared with only 25 per cent. for the latter, but the symptoms produced by both were indistinguishable. *P. cactorum* further proved capable of infecting the following plants susceptible to *P. cinnamomi*: *Antirrhinum* [*majus*], beech, broad bean, *Calceolaria*, *Nicotiana glutinosa*, *Schizanthus*, and stock [*Matthiola*]; it is also capable of causing rot of apple, pear, and tomato fruits, carrot roots, and potato tubers; of inducing local symptoms in *Gloxinia*, tobacco, *Primula obconica*, *Solanum capsicastrum*, and strawberry; and of destroying peas, *Rhododendron ponticum*, and tomato seedlings. *Phytophthora cactorum* may be combated by the methods recommended against *P. cinnamomi* [ibid., xv, p. 656].

Enid Oyler also investigated a leaf spot of marguerites (*Chrysanthemum frutescens*) caused by *Ramularia bellunensis*, previously reported from Italy [ibid., viii, p. 723] but not hitherto known to occur on this host in England. The foliage was attacked at all stages of development and bore irregular, greyish-brown, later darkening spots originating on the under side at the leaf tips and along the margins. The lesions spread inwards towards the midrib until the whole leaf turned brown and shrivelled. Hyaline spores were produced in the centres of the spots on

both leaf surfaces, a substomatal stroma giving rise to fasciculate conidiophores. Pure cultures of the fungus, applied to healthy marguerite leaves on plants in damp, shaded places in February and March, induced typical leaf-spot symptoms, but negative results were obtained in tests carried out later in the year or on plants more favourably situated in respect of light and ventilation.

H. L. White, in the course of a survey of glasshouse bean [*Phaseolus vulgaris*] diseases in ten nurseries, observed three of economic importance, viz., halo blight (*B[acterium] medicaginis* [var. *phaseolicola*: ibid., xvi, p. 727; xvii, p. 218], foot rot (?*Fusarium solani* var. *martii*) [ibid., xvi, p. 727], and mosaic [ibid., xvii, p. 5], of which both the first- and last-named have been shown to be seed-borne.

Continuing his studies on virus diseases G. C. Ainsworth found that lettuce mosaic [ibid., xvii, p. 6] is also transmitted by means of the seed. In a test in which a total of 1,828 plants of the Trocadero, Feltham King, and Lobjoit's Dark Green Cos varieties were raised from infected seed, 101 (5·55 per cent.) developed slight stunting and a distinct mottling of the second or third foliage leaf. Healthy lettuce plants inoculated with the juice from these infected seedlings also contracted typical mosaic symptoms. Diseased seed would thus appear to constitute the main source of initial infection in lettuce plantings under glass, while aphids are concerned in the subsequent spread of the virus. The use of virus-free seed and careful examination of the seedlings before transplanting should serve to control lettuce mosaic in glasshouses, while in the field the incidence of infection may be reduced by early roguing of diseased plants and sowing at times when aphids are scarce and in situations unlikely to attract them. It has been established that the disorder occurring at Cheshunt is identical with that described by Ogilvie [loc. cit.] from the west of England.

Inoculation tests on White Burley tobacco and *Zinnia* [? *elegans*] confirmed Price's conclusion as to the close relationship of lily mosaic and cucumber virus 1 [ibid., xvi, p. 615], but for the present the retention of the former designation as a special strain is advocated. *Gaillardia* and *Polyanthus* plants from Scotland and Wales, respectively, also yielded a virus identical with cucumber virus 1, not hitherto recorded on the former host in Great Britain.

The presence of the virus of tobacco necrosis [ibid., xvi, p. 637] has been definitely established in the experimental greenhouse at the Station.

In tests against tomato leaf mould (*Cladosporium fulvum*) W. H. Read found that promising results were given by a mixture of red cuprous oxide and a standard oil emulsion spray in the proportion of ¼ oz.: 1 gall. Promise was also shown by a complex ammonium silicate containing copper [ibid., xvii, p. 541] and zinc in combination with an oil emulsion. Neither rose nor cucumber mildew (*Sphaerotheca pannosa* and *Erysiphe cichoracearum*, respectively) was as well controlled by the cuprous oxide as by a bouisol-petroleum oil mixture [ibid., xvi, p. 726]. *C. fulvum* and *S. pannosa* were also effectively combated by a blend of colloidal copper hydroxide and petroleum oil. Cuprous and zinc oxide dusts, thoroughly shaken up with tomato seeds, failed to protect the latter against damping-off caused by *Phytophthora cryptogea* [ibid., x, p. 413].

RASMUSSEN (L.). **Oversigt over Resultaterne of Landboforeningens Forsøgsvirksomhed paa Sjaelland 1937.** [Survey of results of the experimental work of the Agricultural Union in Zealand in 1937.]—*Beretn. Planteavl., Sjaelland, 1937*, pp. 231–292, 1938.

The following are among the items of interest in the section of this Danish report dealing with the control of plant diseases. A substantial reduction in the incidence of grey speck of oats and beets [*R.A.M.*, xv, p. 87; xvi, pp. 82, 596] was effected by the application to the soil of manganese sulphate at the rate of 50 kg. per hect. In experiments on wheat suffering from the same disorder manganese sulphate increased the grain and straw yields by 1·9 and 4·2 hectokg. per hect., respectively (average of two trials).

The potato yields from tubers treated with sanagran [see below, p. 586] and uspulun dusts and aretan solution [ibid., xvii, p. 481] against stem canker [*Corticium solani*: see below, p. 621] were 189, 163, and 197 hectokg. per hect. as compared with 167 for the untreated controls, the corresponding amounts of infection on the stems being 12, 10, 2, and 52, and on the tubers 47, 45, 38, and 64 per cent., respectively.

LEPIK (E.). **Phytopathologische Notizen 10.** [Phytopathological notes 10.]—*Bull. phytopath. Exp. Sta. Univ. Tartu* 43, pp. 213–225, 4 pl., 1938.

Pseudomonas [*Bacterium*] *tumefaciens* is stated to have been causing severe damage of late years in Estonian nurseries, especially among superior apple and pear varieties and grafts. *Neofabraea* [*Myxosporium*] *corticola* [*R.A.M.*, xv, p. 468] was observed at Dorpat for the first time in 1935 on apples and pears.

An organism resembling *Bact. sepedonicum* [ibid., xvi, p. 628] was found to be associated with a dry ring rot of potato tubers, first observed in Estonia in 1934; externally invisible in the early stages, it first becomes evident in the form of gradually developing, more or less extensive superficial cracking: even when the interior is completely rotted there are no conspicuous outward symptoms of the trouble except the extremely light weight of the tubers, and the concentration of the starch in the form of white, floury, dry nodules which rattle on shaking the potatoes. A layer of the cortex, 1 to 2 cm. in thickness, remains sound throughout the course of the disease. The repulsive odour of butyric acid, characteristic of ordinary wet rot, is absent from tubers affected by the new ring rot. Infection appears to originate in the vascular bundles. Among other organisms present in the diseased tissues were *Bacillus phytophthorus* [*Erwinia phytophthora*], *Fusarium* sp., and *Cladosporium herbarum*, the fungi at any rate being of secondary importance while the respective roles of the bacteria in the initiation of the disease are not yet clear. The Deodara variety is the most susceptible.

In the central and southern parts of the country the spring of 1934 was exceptionally early, following a mild winter, with the result that barberry and *Rhamnus cathartica* leaves, normally covered at this period with the aecidia of *Puccinia graminis* and *P. coronifera* [*P. lolii*], respectively, were rust-free, owing to the late germination of the teleutospores and the plants having developed with sufficient vigour to

withstand infection. In the autumn of the same year infective aecidia of *P. dispersa* [*P. secalina*] were still present on *Anchusa arvensis* and *A. officinalis* as late as 16th October, by which time the early-sown rye had germinated and was severely attacked by the rust.

Dry rot (*Merulius domesticus*) [*M. lacrymans*], occasionally in association with *M. minor* [ibid., xvii, p. 216] and *Poria vaporaria*, has been prevalent of recent years, 90 per cent. of the cases occurring in recently erected buildings.

Other new records include *Oidium euonymi-japonici* on *Euonymus japonica* [ibid., xii, p. 578], *Ascochyta beijerinckii* on plums, *A. fagopyri* on buckwheat, *Cercosporella brassicae* on turnips [ibid., xv, p. 467], *Cladosporium album* [*Erostrotheca multiformis*] on sweet peas [ibid., ix, p. 629], *C. cucumerinum* on cucumber [ibid., xvii, p. 370], *Fusarium conglutinans* var. *callistephi* and *Verticillium albo-atrum* on *Callistephus* sp. [ibid., xvii, pp. 247, 248], *Phyllosticta cannabis* on hemp [ibid., xvi, p. 749], and *P.* [*Pleosphaerulina*] *sojaecola* on soy-bean [ibid., xi, p. 88].

LUTHRA (J. C.). **India: some new diseases observed in the Punjab and mycological experiments in progress during the year 1937.**—*Int. Bull. Pl. Prot.*, xiii, 4, pp. 73–74, 1938.

The following are among the items of interest in this brief report on mycological observations and investigations in the Punjab in 1937. Serious damage to the *Colocasia* crop in many parts of the Kangra Valley was caused by *Phytophthora colocasiae* [*R.A.M.*, xvi, p. 301]. Citrus seedlings were attacked and sometimes killed by a species of *Phoma*. *Rhizoctonia* sp. was found on gram (*Cicer arietinum*) [ibid., ix, p. 10].

Plant diseases. Notes contributed by the Biological Branch.—*Agric. Gaz. N.S.W.*, xlix, 4, pp. 207–210, 6 figs., 1938.

In these notes [cf. *R.A.M.*, xvii, p. 297] it is stated that satisfactory control of shot hole of stone fruits [*Clasterosporium carpophilum*: ibid., xvii, p. 256] in New South Wales may be obtained by spraying with Bordeaux mixture (6–4–40) combined with an efficient spreader twice a year at the end of leaf fall in autumn, and in spring when a trace of petal colour is apparent in the swollen blossom buds.

Sooty blotch of citrus fruits attributed to *Leptothyrium* sp. [ibid., xvi, p. 451] produced irregular, diffuse, black blotches on the rind, causing appreciable losses only in the warmer coastal districts. Almost absolute control was obtained by application of a single spray of Bordeaux mixture (6–6–80–½) or lime-sulphur (1 in 40) in April to May.

Leaf spot of *Gerbera* is mostly caused by *Cercospora* sp. or sometimes by *Septoria gerberae* [ibid., xvii, p. 294]. The *Cercospora* produces infected areas on the leaves varying in size from that of a pin's head to ¼ in. in diameter, merging into large brown necrotic areas in case of severe infection. The *Septoria* leaf spot is characterized by purplish-black blotches on the foliage, often resulting in death of several leaves on the plant. The use of seeds from clean plants only, planting in clean soil, and spraying both surfaces of the leaves with Bordeaux mixture (4–4–50) at the first appearance of the disease, and then at intervals of two or three weeks, are the measures recommended for

control. In the case of severely diseased plants all infected leaves should be removed and burnt before spraying.

WATERSTON (J. M.). **Report of the Plant Pathologist, 1937.**—*Rep. Bd Agric. Bermuda, 1937*, pp. 24–37, 1938.

An enormous loss of crop products in Bermuda as a result of unnecessary wastage is ascribed in this report [cf. *R.A.M.*, xvi, p. 796] chiefly to the lack of adequate cold storage facilities, owing to which the crops are harvested according to the arrival and departure of steamships and often not in their proper stage of maturity. Good grading and pre-cooling facilities are stated to be also absolutely essential for solving the present problem of wastage. The spread of fungous diseases in Bermuda is favoured by high relative humidity (average 77 per cent. for 1937), which is further increased by close planting intended to minimize wind damage. The following soil-borne fungi have been found to accumulate through absence of frost and lack of crop rotation: *Sclerotinia sclerotiorum* (ubiquitous) [ibid., xvii, p. 217], *Phytophthora infestans* on potato, *Septoria apii* on celery [ibid., xvii, pp. 289, 498], and *Peronospora destructor* [*P. schleideniana*; ibid., xvi, p. 651] on onions, which became very prevalent after heavy rain in April. *Fusarium* [*bulbigenum* var.] *lycopersici* commonly occurred on tomatoes [ibid., xvi, p. 797; xvii, p. 419] grown without rotation, and *Corticium rolfsii* [ibid., xvi, p. 515; xv, p. 401] and *C. vagum* [*C. solani*] were found during the summer on carrots and potatoes. The height of the water table was observed to affect the time of appearance of *Phytophthora infestans* on potatoes and *S. apii* on celery. *Sclerotinia sclerotiorum* is stated to be probably the most destructive fungus in Bermuda, causing serious crop losses both in the field and during storage, and occurring on 35 host plants, including celery, cabbage, cucumber, carrot, roselle [*Hibiscus sabdariffa*], lettuce, tomato, parsley, peas, Irish potato, and clover (*Trifolium hybridum*). *Lilium longiflorum* var. *eximium* is apparently the only crop of economic importance which is not attacked. Field observations on *S. sclerotiorum* again showed that the infection was transmitted by air and not through the soil. The apothecial stage of the fungus was found in nature from January to March, while from May to June the fungus disappeared completely and its place was taken by *C. rolfsii* and *C. solani*, which are responsible for both field and storage rots during the summer. Of 6,505 carrot plants examined during February an average of 28 per cent. was infected with *S. sclerotiorum*. In comparative tests weeded plots showed 30 per cent. leaf infection by the fungus, as compared with 51 per cent. in the unweeded plot and 14 per cent. in the unweeded plot which had received a top-dressing of sulphur at a rate of 5 lb. per sq. rod. These figures illustrate the importance of humidity and are considered alarming, as the tests were made during very dry weather, which was not favourable to the spread of the disease. In cold storage experiments, carefully graded carrots showed a range of 0 to 4 per cent. and an average of 1·1 per cent. infection with *S. sclerotiorum* per crate, while similar carrots packed by farm labour showed 1·5 to 20·9 per cent. and 8·5 per cent., respectively. The principal causes of depreciation of Bermuda celery lie in the wilting caused by undue exposure in the field and in the rots caused by *S. sclero-*

tiorum, *S. apii-graveolentis*, and *Bacillus carotovorus* [*Erwinia carotovora*]. The trimming of the green tops of celery in accordance with the present shipping regulations was observed to restrict the loss of water in the plant and to reduce the amount of *Septoria* blight.

The need for a scientific system of sylviculture in Bermuda is stressed particularly with regard to the depressed state of the Bermuda cedar (*Juniperus bermudiana*). The chief disease of the cedar [ibid., xvii, p. 361] was found to be caused by a fungus apparently identical with a form of *Polyporus carneus* Auct. Amer., although a culture isolated at Princes Risborough, England, was not found to be typical of this species. *Gymnosporangium bermudianum* [loc. cit.] forms small, rounded galls, which are deep red at first and then turn dark brown, on the twigs of the cedar, and eventually kills the portions of the twig distal to the point of infection. *Pestalozzia funerea*, a species of *Phomopsis*, and *Pitya cupressi* were isolated from blighted cedar foliage. Thinning, pruning, and the use of surgical methods are recommended against the diseases.

Other diseases of economic plants include *Stachylidium theobromae* causing cigar-end disease of Cavendish bananas [ibid., xvi, p. 110], recorded for the first time in the Colony; a species of *Phytophthora*, provisionally assigned to the *P. palmivora* group, was isolated from green fruits of the tomato varieties Marglobe, Pritchard, and Break o' Day, causing brown spots on the fruit, the tissue remaining quite firm; *Puccinia antirrhini* [ibid., xvii, p. 396], first noted on snapdragon [*Antirrhinum majus*] towards the end of April, when it was too late to do any real damage; and the new records *Lenzites sepiaria*, destructive to worked wood, and *Leptodermella opuntiae* from prickly pear (*Opuntia dillenii*) [ibid., xvii, p. 461]. Rosette of lilies [ibid., xvi, p. 797] was low in incidence and was kept well under control by roguing.

De Nardo (A.). **Appendix IV. Report on plant pathology.**—*Rep. Dep. Agric. Malta, 1936–37*; pp. lx–lxiii, 1938.

In this report [cf. *R.A.M.*, xv, p. 780] it is stated that during the period under review the following were among the most serious fruit-tree diseases in Malta: *Armillaria mellea*, which was very injurious in several localities, *Sphaerotheca pannosa* and *Exoascus* [*Taphrina*] *deformans* on peach and almond [ibid., xvi, p. 389 *et passim*], *Sclerotinia linhartiana* [ibid., vi, pp. 337, 430] causing severe injury to the service tree [*Pyrus aucuparia*], and *Venturia pirina*, which seriously damaged all pear varieties, especially late ones. Important damage resulted from gummosis of Amygdalaceae and citrus trees, and a canker of citrus trees [ibid., xiii, p. 81].

Edson (H. A.) & Wood (Jessie I.). **Diseases of plants in the United States in 1936.**—*Plant Dis. Reptr, Suppl.* 103, 244 pp., 12 graphs, 8 maps, 1938. [Mineographed.]

The estimates here presented in tabular form of the losses caused among cereal, vegetable, fruit, and miscellaneous crops by fungal, bacterial, virus, and physiological diseases in the United States in 1936 have been prepared on the usual lines [*R.A.M.*, xvi, p. 826].

Plant pathology and physiology.—*Rep. Tex. agric. Exp. Sta., 1936*, pp. 85–116, 1937. [Received June, 1938.]

In addition to work already noticed from other sources [*R.A.M.*, xvii, pp. 34, 316], the following items of interest occur in this report. In a field containing dying cotton, sclerotia of *Phymatotrichum omnivorum* [loc. cit.] were found beneath a sprouting elm stump at a depth of 5½ ft., close to deep-seated root-rot lesions on the taproot; 67 per cent. of these sclerotia germinated readily. Planting a barrier of three sorghum rows between an inoculated and an uninoculated cotton plot from 1932 to 1936 successfully prevented the spread of the root rot in each year. In 1933, 1934, and 1935 sulphur slabs 4 by 4 ft. and 1½ in. thick were used as barriers and the results showed that neither cotton roots nor the strands of *P. omnivorum* were able to penetrate the slabs.

Two isolations from tomato referred to *Myrothecium*, one from a decayed spot on a fruit and the other from a stem canker, and *M. roridum* [ibid., xvi, p. 320], isolated from snapdragon [*Antirrhinum majus*], were inoculated into normal tomato plants and each produced entirely distinct symptoms. The three organisms also showed quite different characteristics when grown on nutrient agar. It is concluded that these two new isolations probably represent distinct species, especially since *M. roridum* is only weakly parasitic on tomato fruits.

A series of experiments on the effect of medicated wraps or dips in the control of storage rots of tomato showed that unoiled paper wraps impregnated with 1½ per cent. copper salt plus 4 per cent. sulphur gave very effective control; iodized paper wraps covered by an outer wrap of moisture-proof cellophane (300 MT) were more effective than either of these alone; paper wraps impregnated with 1½ per cent. copper salt with or without oil also gave good promise; and rolling tomatoes in dry wettable sulphur or cuprocide [see below, p. 608], or a combination of both, generally led to a decrease of decay.

Studies on *Diplodia* die-back of roses [cf. ibid., xvii, p. 113] indicated considerable differences in varietal susceptibility to the disease, Pierre S. Du Pont, Souvenir, Georges de Pernet, A. R. Briarclough, Governor Alfred E. Smith, and Luxembourg being highly susceptible, and Radiance, Étoile de Hollande, Edith Nellie Perkins, Lady Hillingdon, Antoine Rivoire, Johanna Hill, and Kaiserin A. Viktoria apparently resistant. *Diplodia* sp., *Phomopsis* sp., *Pestalozzia* sp., *Phoma* sp., and *Botrytis* sp. were isolated from infected plants. The disease was reproduced by a *Diplodia* obtained from rose canes in both field and laboratory inoculation experiments. Isolations from rose canes affected with die-back, stored in an open shed, made at irregular intervals during 1934 and 1935, yielded large percentages of *Diplodia*; during 1936 colonies of *Diplodia* developed on 26·5 per cent. of the material. In control tests spraying with 3–3–50 Bordeaux plus 5 lb. wettable sulphur or dusting with a mixture consisting of 10 parts 300-mesh Spider brand sulphur, 1 part cuprocide, and 1 part lead arsenate resulted in only a slight reduction in die-back; disbudding reduced die-back from 10·15 per cent. in the check plots to 1·21 per cent. in the pruned plots.

Monthly counting of spots on rose leaves infected with *Actinonema* [*Diplocarpon*] *rosae* [ibid., xvii, p. 459] showed that the highest per-

centage of infection occurred during January, February, May, June, October, November, and December, and the lowest during July, August, and September. Germination of spores collected from January to June ranged from 49 to 82 per cent., dropped to 19 per cent. during July, 3 per cent. in August, and 5 per cent. in September, rising again to 42 per cent. in October, 61 per cent. in November, and 81 per cent. in December. It is concluded that the viability of the spores of *D. rosae* is probably affected by weather conditions.

CARDOSO (J. G. A.). **Mozambique : parasites of cultivated plants observed in the province of Sul do Save.**—*Int. Bull. Pl. Prot.*, xii, 4, pp. 74–76, 1938.

A list is given of some well-known diseases of fungal, bacterial, physiological, or undetermined origin affecting cultivated crops in Mozambique.

SĂVULESCU (T.). **Biologische Studien über den Weizenbraunrost in Rumänien.** [Biological studies on the Wheat brown rust in Rumania.]—Reprinted from *Jubiläumfestschrift 'Grigore Antipa'*, 67 pp., 3 col. pl., 13 figs., 15 graphs, 1 map, Impr. nat., Bucharest, 1938.

In this report the author gives an account of his experiments and observations over several years to clarify certain biological aspects of the occurrence and development of wheat brown rust (*Puccinia triticina*) in Rumania, a few results of which have already been noticed from a recent publication [*R.A.M.*, xvii, p. 510]. Temperature is apparently the main factor in the successful infection of the wheat crops with uredospores; for biological race 13, which prevails in the country, the minimum temperature for germination of the uredospores was shown to be 2° to 3° C., the optimum 10° to 22°, and the maximum 30° to 32°, the corresponding temperatures for growth of the germ-tubes being 5° to 6°, 16° to 20°, and 31°. The longevity of the uredospores varies with the time of their formation and with the wheat variety on which they are produced; the most vigorous are those that develop in May at a temperature of 15° to 20°. The optimum temperature for virulence and infectivity does not agree with those for germination or growth of the spores. The development of teleutospores on wheat is not directly determined by climatic conditions, but by the advanced stage of development of the host; they were found to retain their viability for two years. While *Thalictrum* was not found to be infected with brown rust in nature, successful infection was experimentally obtained with the teleutospores on *T. flavum*, *T. aquilegifolium*, *T. bauhini*, and *T. minus*, on the first-named of which well-developed aecidia were produced. The results of inoculation experiments with race 13 on a number of pure wheat lines grown in Rumania showed that the variety American 17 is physiologically immune from the rust, while American 15 and 26 proved to be markedly resistant in the field owing to certain anatomical and morphological peculiarities, and Sandu-Aldea 70 exhibited a high degree of tolerance to the fungus. As a class, summer wheats are more severely attacked than winter wheats. The results of further studies indicated that the greatest resistance to brown rust was exhibited by varieties with small, narrow leaves, and by those

with a thin haulm, in which the epidermis, cuticle, assimilating tissue, and sclerenchyma are poorly developed. It was also found that, in general, varieties with high osmotic pressure were the most resistant, and those with low osmotic pressure were the most susceptible, but this point needs further investigation, in view of the behaviour of certain pure lines which showed considerable variation from this general rule.

KOSTOFF (D.). **Triticum timococcum, the most immune Wheat experimentally produced.**—*Chron. bot.*, iv, 3, pp. 213–214, 1938.

In wheat-breeding work against fungal diseases [*R.A.M.*, xv, p. 352] the most promising resistant segregates obtained by the author recently were derived from the composite crosses (*Triticum dicoccum* × *T. monococcum*) × *T. vulgare* and (*T. compactum* × *T. timopheevi*) × *T. vulgare*. The author also produced the amphidiploid form *T. timopheevi-monococcum* ($n = 21$, $2n = 42$) after chromosome duplication in the F_1 hybrid, the chromosome number of this amphidiploid, named *T. timococcum*, being the same as that of *T. vulgare*. *T. timococcum* combines the disease immunity of *T. timopheevi* and *T. monococcum*. It also has larger grains than the parents. In the summer of 1937 it was grown at Moscow among the world collection of wheats, most of which became affected by rusts [*Puccinia* spp.], bunt [*Tilletia caries* and *T. foetens*], and mildew [*Erysiphe graminis*], though *T. timococcum* remained entirely unaffected. Artificial inoculations of this wheat with various rusts were unsuccessful. Of all the wheats known at the present time *T. timococcum* approaches most nearly to complete immunity from all diseases, and is the most promising form for breeding immune varieties.

GARRETT (S. D.). **Take-all or whiteheads disease of Wheat and Barley and its control.**—*J. R. agric. Soc.*, xcviii, pp. 24–34, 1937.

Take-all of wheat due to *Ophiobolus graminis* [*R.A.M.*, xvii, p. 448] is reported to have increased in England during the last few years, the most serious outbreaks having occurred on the lighter chalk soils of Wiltshire, Hampshire, Cambridgeshire, Norfolk, and Yorkshire, especially in 1935 and 1937, possibly favoured by the mild winters. The author describes the life-cycle and the development of the fungus in the field and discusses measures of control. In conditions favourable to the fungus, it may survive a full year, but in unfavourable circumstances not more than a few months. Thus, on heavy soils it may be safe to grow wheat after a slightly diseased crop of wheat provided that ploughing has been done early and drilling late, and that adequate organic manure has been applied, but on light soils it is dangerous. An interval of at least three months should be allowed between ploughing-under the diseased stubble and planting another cereal crop. On light soils the depth of cultivation should be reduced and the soil compacted by repeatedly rolling the crop in spring; on the heavier soils loose and cloddy seed beds and the ploughing-in of long straw which is liable to open the soil should be avoided. Manuring is advocated as a means of indirect control by improving the general condition of the plant, and superphosphate is stated to have a controlling effect on the disease by promoting vigorous root development.

Ikata (S.) & Kawai (I.). **Studies in the stripe disease of Wheat.**—*Bull. agric. Exp. Sta. Okayamaken*, Extra No., 111 pp., 12 pl., 1937. [Japanese. Abs. in *Jap. J. Bot.*, ix, 2, p. (40), 1938.]

Cephalosporium gramineum infects wheat plants in Japan [*R.A.M.*, xiii, p. 623] through the roots, the vessels of which become filled with the mycelium and conidia of the fungus. The filtrate from nutrient solutions on which the organism has grown contains a toxin inhibiting seedling growth. The conidia are destroyed by 20 to 40 days' exposure to water at 29° to 39·5° C., so that they are unlikely to survive the summer in marshy localities but may well persist in dry sites. The minimum, optimum, and maximum temperatures for growth and conidial germination were found to be about 5°, 20°, and 30°, respectively. Under humid conditions *C. gramineum* succumbs within 96, 12, and 2 hours, 1 hour, and 5 minutes, respectively, to temperatures of 40°, 45°, 50°, 55°, and 60°, whereas in a dry state it may remain alive for 30 minutes at 80°. It was found to withstand six hours' exposure to — 20°. Mercuric chloride at concentrations of 1 in 3,000 and 1 in 500 destroyed the fungus in 40 and 5 minutes, respectively.

D'Oliveira (B.). **Brown rust of wild species of Hordeum.**—*Rev. agron., Lisboa*, xxv, 3, pp. 230–234, 1937. [Received July, 1938.]

The problem of differentiation between *Puccinia anomala* and *P. hordei* Fckl on wild barleys [*R.A.M.*, xv, p. 209] presents considerable difficulties. Such differences as have been described by various authors are believed to rest on a confusion between *P. glumarum* and *P. anomala*, which commonly occur together on wild *Hordeum* spp. but are readily distinguishable by close observation and cultural studies. An attempt was made to determine whether *P. hordei* should be regarded as a distinct species, or merely as a physiologic race of *P. anomala* [ibid., xvii, p. 231] by ascertaining the host ranges of the two rusts by comparative inoculation experiments with five cultures of the brown rust, of which Nos. 1, 3, and 5 originated at Cambridge on *H. murinum*, *H. maritimum*, and *H. secalinum*, respectively, while 2 and 4 were collected at Lisbon, the former on *H. murinum* and the latter on *H. maritimum*.

The results of the cross-inoculation trials [which are tabulated] showed that the cultures, with the partial exception of No. 2, are narrowly confined to their original host species. None produced pustules on the cultivated barleys (Spratt Archer and Hey's differential hosts for *P. anomala*) used in the tests. In this respect the wild barley cultures deviate markedly from the physiologic races found on cultivated varieties, but such a difference does not, in the writer's opinion, entitle them to specific rank as *P. hordei* but merely denotes a high degree of physiologic specialization in *P. anomala*.

Olsen (H. K.). **Forsøg og Undersøgelser vedrørende kemiske Midler til Bekæmpelse af Plantesygdomme og Ukrudt.** [Experiments and investigations concerning chemical preparations for the control of plant diseases and weeds.]—*Beretn. Planteavl., Sjaelland, 1937*, pp. 208–219, 1938.

Stripe disease of barley [*Helminthosporium gramineum*], which oc-

curred in 40 per cent. of the fields inspected, was effectively combated in eight years' experiments (1930 to 1937, inclusive) in various localities of Zealand, Denmark, by all the six disinfectants tested, viz., dahmit, sanagran, dansk tillantin [= ceresan-nassbeize], abavit-neu, and tillantin 1875 [= ceresan U.T. 1875: *R.A.M.*, xvii, p. 90], the average incidence of infection in the treated lots being 0·2 per cent. for the first-named and 0·1 per cent. for the five others compared with 6·2 per cent. for the untreated controls.

The average annual increases over the 7-year period in the yields of barley and oats treated against stripe disease and loose smut [*Ustilago avenae*], respectively, by these preparations are estimated at 231 and 167 kg. per hect., respectively.

Loose smut [*U. nuda*] was entirely eliminated from Kenya barley in three years' experiments by immersion in hot water at 51° C., with or without the addition of 1·5 per cent. dahmit or 0·75 per cent. tillantin, but the treatments caused average reduction of grain yield of 51 and 32 kg. per hect., respectively. The disease was present in 86 out of 87 fields examined, in only four of which, however, did the incidence of infection exceed 1 per cent.

Weck (R.). **Flugbrandbekämpfung bei Wintergerste in Eckendorf.** [Control of loose smut of Winter Barley at Eckendorf.]—*Pflanzenbau*, xiv, 10, pp. 369–378, 1938.

An outline is given of the progress gradually accomplished in Germany in the control of loose smut of barley [*Ustilago nuda*: *R.A.M.*, xvii, pp. 514, 516], with special reference to a system now in use on the estate of Eckendorf-Hovedissen for the combined elimination of this fungus and stripe [*Helminthosporium gramineum*]. So successful has the method proved that the two diseases in question are stated to be regarded as curiosities in the neighbourhood. The standard procedure is as follows. The seed-grain, in sacks with a 62·5 kg. capacity, is immersed for two hours in water heated to 45° C. with the addition of 0·075 to 0·1 per cent. ceresan, left for a further six minutes in the same solution tepid or cold, subjected to a preliminary 'cool' drying on Weka Progress driers at 30°, left overnight, given a second thorough drying on Neuhaus clay slabs at 45°, followed by cooling by passage through a narrow-mesh cleansing apparatus, and stored in the granary for several days, during which the heaps should be turned over two or three times. The addition of a fungicide counteracts the well-known depressing action of hot water alone on the germination of the seed-grain. Germisan (0·1 per cent.) was also moderately effective in this respect, though less so than ceresan.

Fawcett (H. S.) & Bitancourt (A. A.). **Relatorio sobre as doenças dos Citrus nos Estados de Pernambuco, Bahia, São Paulo e Rio Grande do Sul.** [Report on Citrus diseases in the States of Pernambuco, Bahia, São Paulo, and Rio Grande do Sul.]—*Rodriguésia*, iii, 10, pp. 213–236, 1937. [Received June, 1938.]

In this second report [*R.A.M.*, xvi, p. 603] the authors give notes on, and recommendations for the control of, the citrus diseases which Fawcett observed during his visit in 1936 in the Brazilian States of

Pernambuco, Bahia, São Paulo, and Rio Grande do Sul. In Pernambuco the more important diseases appeared to be foot rot (*Phytophthora* sp.), psorosis, and possibly also zonate chlorosis and melanosis [*Diaporthe citri*: loc. cit.]. A foot rot of citrus trees was observed in one locality, isolations from which yielded *Macrophomina phaseoli*, and further investigations are in progress to test the part played by this organism. In the same locality nursery sour orange trees showed a condition termed chrysosis, characterized by yellow or golden spots on the leaves resembling those of ring spot, and possibly due to a virus; it was particularly prevalent on trees abundantly infested by red spiders. The most important diseases in Bahia are foot rot (*P.* sp.), psorosis, and possibly zonate chlorosis. In one nursery a destructive root rot of young sour orange trees was found to be associated with *M. phaseoli*. In São Paulo the chief diseases are stated to be foot rot, psorosis, leprosis, melanosis, sweet orange scab [*Elsinoe australis*: loc. cit.], sour orange scab [*E. fawcetti*: loc. cit.], and in Rio Grande do Sul sweet orange scab, melanosis, foot rot, and possibly zonate chlorosis. An annotated list is also given of the less serious diseases in the various States, in all of which, except Pernambuco, a copious entomogenous fungous flora was observed, effecting a large measure of natural control of the scale insects on citrus trees.

Nuksan spots on Oranges.—*Palest. Gaz.* 776, *Agric. Suppl.* 28, pp. 95–97, 1938.

Oranges in Palestine are liable to be disfigured by two types of brown pitting, known locally as shallow and deep 'nuksans' [nooksans: *R.A.M.*, xiv, p. 31; xvi, p. 21]. In the former type there is depression of the flavedo involving the oil glands and the interglandular tissue; the spots are irregular in size and shape, appear on different parts of the fruit, may coalesce into large blemishes, and at first show no discoloration, but later turn yellowish to dull violet or dark brown. In advanced stages the oil glands sink deeper than the surrounding interglandular tissue. This shallow type of blemish is particularly common in rainy years, especially early in the picking season, and is usually found in groves on sandy, clay, or calcareous soil. The trouble is probably due to adverse climatic and soil factors. Severely affected fruit should not be exported. Control consists in applications of organic manures, improved drainage, and deferring picking after rain until the fruit has dried. Oleocellosis of lemons [ibid., xvii, p. 106] resembles shallow nuksans, but the oil glands remain prominent and the spots do not generally enlarge or turn brown.

In the form known as 'deep nuksans' there is a deep depression in the rind, including part of the albedo. The spot is generally round, ¼ to 1 cm. in diameter, watery-yellow, later brown, hard and dry or soft and wet, and with a marked point in the centre; the edges of the depressions are sharp and prominent. As the lesions are few and remain localized, they do not spoil the appearance of the fruit as much as shallow 'nuksans'. They are, however, liable to rot. This type of injury occurs as a rule late in the season and would appear to be due chiefly to external injury, leading to the break-down of the surrounding tissue. Affected fruit should not be exported. Control consists in protection from mechanical injuries by pruning and the use of wind-breaks.

West (E. S.). **Zinc-cured mottle leaf in Citrus induced by excess phosphate.**—*J. Coun. sci. industr. Res. Aust.*, xi, 2, pp. 182–184, 1938.

In the course of a fertilizer experiment with Navel and Valencia orange trees started in 1924 at the Commonwealth Research Station, Griffith, New South Wales, the trees receiving superphosphate developed a mottle leaf, typical of the well-known zinc-cured foliocellosis [*R.A.M.*, xvii, p. 389], while the other plots showed no such symptoms. It is concluded that the injury was due to zinc deficiency induced by phosphate, the excess of which caused the precipitation of the zinc absorbed by the plant. In the presence of phosphate, potash appeared to increase the foliocellosis slightly. Spraying with zinc sulphate gave 26 per cent. diseased trees as compared with 39 per cent. in the unsprayed check.

Winston (J. R.). **Algal fruit spot of Orange.**—*Phytopathology*, xxviii, 4, pp. 283–286, 2 figs., 1938.

In May, 1937, the writer first observed on the rind of Lue Gim Gong oranges from the Everglades, Florida, the dark brown to nearly black, slightly raised spots, averaging about 1 mm. in diameter, with irregular or acutely pointed margins, due to *Cephaleuros mycoidea* [*R.A.M.*, ix, p. 745], previous records of the alga in the State having been confined to the branches and leaves. The resulting penetration and discoloration seldom extended deeper than three or four cells into the flavedo, and there is no reason to suppose that the spotting contributed to the development of decay. The diseased fruit was produced on 7 to 9-year-old trees on drained saw grass [*Cladium germanicum*] muck land, bearing a profusion of weeds.

Rogers (C. H.) & Watkins (G. M.). **Strand formation in Phymatotrichum omnivorum.**—*Amer. J. Bot.*, xxv, 4, pp. 244–246, 11 figs., 1938.

The authors give an account of their studies of the formation of strands by *Phymatotrichum omnivorum* [*R.A.M.*, xvii, p. 456] on the roots of cotton plants, in pure cultures, and among hyphae developing from sclerotia. The results showed that under all these conditions the process is similar. The developing mycelium is composed of large hyphae, ranging in diameter from 15 to 40 μ, with septa at irregular intervals and repeatedly branching lateral hyphae of progressively smaller size. Some of the smaller hyphae make contact with the larger at irregular intervals and begin to grow over their surface, this process continuing until the central hypha is covered with a more or less compact pseudoparenchyma. Subsequent layers of cells are deposited in the same manner on the strand. Acicular hyphae are formed by the proliferation of certain cells in the outer layers of the strand and may reach considerable length, develop whorled branches, and begin to assume a transparent yellow or light-brown colour, presenting the aspect of more or less rigid spines. Various observations suggest that the compound hyphal structures are produced by the fungus when it approaches maturity, and that the strands are apparently not necessarily direct precursors of hyphal invasion of the host.

DRECHSLER (C.). **New Zoopagaceae capturing and consuming soil amoebae.**—*Mycologia*, xxx, 2, pp. 137–157, 4 pl., 1938.

The author describes [with Latin and English diagnoses] four further species of the Zoopagaceae [*R.A.M.*, xiv, p. 508; xvi, p. 634] subsisting by the capture of amoebae in the United States, considered to be new to science, namely: *Zoopage mitospora* occurring in leaf mould; *Z. thamnospira* in decaying tomato roots in a greenhouse; *Stylopage cephalote* in decaying spinach roots and in partly buried decaying leaves; and *Acaulopage acanthospora* in decaying plant remains. A full Latin diagnosis is also given of the family Zoopagaceae.

KILE (R. L.) & ENGMAN (M. F.). **Further studies of the relation of Pityrosporum ovale to seborrheic eczema.**—*Arch. Derm. Syph., Chicago*, xxxvii, 4, pp. 616–626, 5 figs., 1938.

In a further series of experiments at Washington University with *Pityrosporum ovale* [*R.A.M.*, xiv, p. 696], significant reactions frequently followed inoculation of the chest, while clinical seborrheic eczema of the scaly type was often reproduced by the introduction of whole cultures of the fungus into the intact skin of the scalp. Intradermal tests with pityrosporin provoked only mild reactions which could not be correlated either with the presence or absence of the disorder under investigation. *P. ovale* was detected in the scales of 21 out of 24 of the patients examined with blepharitis marginalis of the eyelids, and in nearly every case in the lashes as well.

BENEDEK (T.). **On a new species of the genus Microsporum, Microsporum stilliansi, Benedek, 1937, n. sp., with special consideration of the phenomenon of dissociation in fungi imperfecti.**—*J. trop. Med.* (*Hyg.*), xli, 7, pp. 114–118, 12 figs., 1938.

This is an exhaustive account of the writer's clinical, cultural, and morphological studies [with a Latin diagnosis] on *Microsporum stilliansi* n. sp., the agent of tinea capitis in three coloured brothers, aged 7, 10, and 14 years, at Chicago.

Giant cultures on beer wort agar presented after four weeks' growth certain remarkable features serving to differentiate the fungus from other known *M.* spp. The surface revealed a central conical elevation and configuration consisting of vermiform gyri. Sectoring was also observed, one dissociate (A) being white and powdery, and the other (B) chocolate-coloured and glabrous; no evidence of reversion to the parent type was detected through a dozen generations. On beer wort agar the simple or branched conidiophores of (A) measure 10 to 30 by 2 μ, the oval or round, sessile conidia 3·75 by 3·75 or 7·5 by 7·5 μ, those of the piriform pedunculate type 3·75 by 1·5 μ, and rare intercalary or terminal chlamydospores 3·75 by 3·75 μ. Spore formation in (B) is confined almost exclusively to hyaline to bright yellowish-brown chlamydospores, 7·5 by 5·6, 7·5 by 7·5, or 9·3 to 11·5 by 5·6 to 7·5 μ. Nodular organs and coremia are abundantly produced. On Conant's polished rice medium [*R.A.M.*, xvii, p. 174] (which proved extremely valuable for differential studies on this and other *M.* spp.), sessile or pedunculate conidia, 3·5 by 3·5 μ, were also formed by dissociate (B), while both (A) and (B) produced loosely coiled spiralled hyphae.

Müller (H.), Essed (W. F. R.), & Hazebroeck (F. E. A.). **Ein Fall von Chromoblastomykose in Ost-Java.** [A case of chromoblastomycosis in East Java.]—*Geneesk. Tijdschr. Ned.-Ind., 1937*, pp. 3259–3268, 1937. [Dutch, with English summary. Abs. in *Zbl. Haut- u. GeschlKr.*, lix, 5–6, p. 318, 1938.]

A description is given of a case of chromoblastomycosis caused by *Trichosporium* [*Hormodendrum*] *pedrosoi* [*R.A.M.*, xvi, p. 812 and next abstract] in East Java. Skin tests with fungal extracts yielded positive results.

Popoff (I. S.), Heft (B. B.), Antimonova (Mme Z. S.), & Litvinenko (D. I.). **Fall von Chromoblastomykose.** [A case of chromoblastomycosis.]—*Vyestn. venerol. derm.*, xii, pp. 1170–1173, 1937. [Russian. Abs. in *Zbl. Haut- u. GeschlKr.*, lix, 7–8, p. 445, 1938.]

The fungus isolated from a case of chromoblastomycosis of the leg in a 35-year-old woman in the U.S.S.R. corresponded in the main with *Acrotheca* [*Hormodendrum*] *pedrosoi* [see preceding abstract], from which it differed chiefly in the production of conidia laterally as well as terminally.

Tobias (J. W.) & Niño (F. L.). **Estudio de una nueva observación de granuloma paracoccidioídico (forma linfático-visceral).** [A study of a new observation on paracoccidioidal granuloma (lymphatic-visceral form).]—*Prensa méd. argent.*, xxv, 5, pp. 232–243; 6, pp. 286–301, 67 figs., 2 graphs, 1938.

Paracoccidioides brasiliensis [*R.A.M.*, xvi, p. 461] was isolated in pure culture on Sabouraud's glucose agar from a fatal case of granuloma involving the lymphatic glands and viscera of a 35-year-old Pole in the Argentine. An intensive clinical study was made of the case, of which a full report is given.

Polano (M. K.). **Een epidemie van Muizenfavus te 's-Gravenhage.** [An epidemic of Mouse favus at 's-Gravenhage.]—*Ned. Tijdschr. Geneesk.*, lxxxii (II), 18, pp. 2114–2115, 1 pl., 1938. [French, English, and German summaries.]

Details are given of an epidemic of mouse favus at a shoemaker's shop at 's-Gravenhage, Holland. *Achorion quinckeanum* [*R.A.M.*, xvi, p. 535] was isolated on Sabouraud's medium both from the diseased animals and from three human patients to whom infection was communicated.

Ferrabouc (L.), Sohier (R.), Henrion (J.), & Goulène (F.). **Mycose verruqueuse.** [Verrucose mycosis.]—*Bull. Soc. franç. Derm. Syph.*, xlv, 1, pp. 4–7, 2 figs., 1938.

Clinical details are given of a case of verrucose mycosis of the hands, due to *Trichophyton rubrum* [*R.A.M.*, xvii, p. 38 and next abstract], in a 32-year-old soldier in the colonial service, who had contracted the disease at Tonkin, Indo-China, ten years earlier.

Gougerot (H.), Burnier [R.], & Duché [J.]. **Polyépidermomycose disséminée due à Epidermophyton inguinale et à Epidermophyton rubrum.** [Disseminated polyepidermomycosis due to *Epidermophyton inguinale* and *Epidermophyton rubrum*.]—*Bull. Soc. franç. Derm. Syph.*, xlv, 1, pp. 29–30, 1938.

Two fungi were simultaneously isolated in pure culture on Sabouraud's test medium from a case of disseminated erythemato-squamous dermatosis in a 35-year-old naval mechanic recently returned to France from China, viz., *Epidermophyton* [*Trichophyton*] *rubrum* [see preceding abstract] and *E. inguinale* [*E. floccosum*: *R.A.M.*, xvii, p. 321]. A third fungus *Malassezia furfur* [ibid., xvii, p. 529] was present in the brown scattered patches of pityriasis versicolor on the same patient.

De Gregorio (E.). **Nota previa al estudio de la flora dermatofítica en Zaragoza.** [Preliminary contribution to the study of the dermatophytic flora of Saragossa.]—*Act. dermo-sifilogr., Madr.*, xxix, 1, pp. 239–241, 1938.

The following organisms were isolated from a total of 108 cases of human and animal dermatomycoses in Saragossa, Spain: *Microsporon audouini* (16), *M. tardum* [*R.A.M.*, xvi, p. 458] (2), *M. lanosum* (3), *Trichophyton gypseum granulosum* [*T. mentagrophytes*: ibid., x, p. 243; xvii, pp. 176, 243, 245] (2), *T. cerebriforme* [ibid., xiv, p. 510; xv, pp. 218, 501] (1), two new species of *Trichophyton*, *T. faviforme album* [*T. album*] (25) [ibid., xvii, p. 321], *T. f. discoides* [*T. discoides*: ibid., xvii, p. 395] (23), *Achorion schoenleini* [ibid., xvii, p. 530] (3), and *Epidermophyton inguinale* [*E. floccosum*: see preceding abstract] (31). *M. audouini* was responsible for an epidemic of ringworm in four brothers. The 25 cases of infection due to *T. album* were found among calves from Asturias, while *T. discoides* developed in 23 persons as a sequel to anti-smallpox vaccination.

Harris (L. H.). **Molds as a cause of allergy.**—*Ohio St. med. J.*, xxxiv, 2, pp. 158–160, 1938.

Particulars are given of a number of cases (all in young people under 30 examined and treated by the author in Ohio) of respiratory allergy of the seasonal hay-fever and asthma types in which moulds, including *Alternaria* sp., *Aspergillus fumigatus*, *A. hortai* [*R.A.M.*, xii, p. 445], *Chaetomium*, *Hormodendrum*, *Mucor*, *Penicillium*, and *Trichoderma* spp., and *Monilia sitophila* [ibid., xvii, p. 243], acted as contributory factors.

Puntoni (V.). **Studi sul genere 'Trichosporon Behrend'.** [Studies on the genus *Trichosporon* Behrend.]—*R. C. Accad. Lincei*, xxvi, 11, pp. 413–417, 1937. [Received May, 1938.]

After giving a summarized historical account of the genus *Trichosporon* since its creation in 1890 by Behrend, the author states that careful studies of arthro-blastosporous fungi have led him to concur entirely with Ota's views on the genus [*R.A.M.*, v, p. 363], which are also accepted by Nannizzi. Culturally the genus is characterized by the cerebroid aspect of cultures on agar media containing sugar, and the crateriform aspect of isolated colonies; by the formation of very

consistent pellicles on the surface of liquid sugar media; and by the moderate capacity of the organisms to break down protein but not sugars. Morphologically it is characterized by a mycelium with septate hyphae, 3 to 5 μ broad, tending rather to form lateral branches than to bifurcate; and by the production of arthrospores, blastospores, and intermediate forms, and also of chlamydospores and of occasional bodies resembling pseudoconidia. Pathologically, it includes pathogens of 'piedra', as well as of mycoses of the skin, mucous membranes, or internal organs. A tentative Latin diagnosis of the genus is appended. Thus based the genus then includes the following species: *T. beigeli*, *T. giganteum*, *T. granulosum*, *T. cutaneum* (culturally and morphologically almost identical with *T. beigeli*), *T. balzeri*, and *T. infestans* [ibid., xv, p. 96], on all of which brief notes are given, chiefly of cultural characters.

Lindegg (Giovanna). **Note fitopatologiche. III. Antracnosi fogliare dell' Agave per 'Colletotrichum agaves' Cav.** [Phytopathological notes. III. Leaf anthracnose of Sisal due to *Colletotrichum agaves* Cav.]—*Riv. Pat. veg.*, xxviii, 3–4, pp. 75–79, 2 figs., 1938.

During spring the basal leaves of *Agave americana variegata* kept during winter in glasshouses in Italy very often wither, and circular or slightly elliptical, depressed, dark spots 1 to 2·5 cm. in diameter surrounded by a raised, dark ring develop on the margins and in the middle of the blade. These spots may become confluent and affect the entire surface of the leaf. The diseased areas showed the presence of a fungus identified as *Colletotrichum agaves* [*R.A.M.*, xvii, p. 322].

Prevention consists in spraying the plants before putting them away for the winter with a 1 per cent. cupric mixture to which a sticker has been added (50 g. casein per hectol., or 1 per cent. saponin) and giving a few further applications during winter of a cupric-sulphur dust. Removal of affected leaves and the same treatment will also control infection once it has started.

Lyle (E. W.) & Massey (L. M.). **Control of stem and graft canker of the Rose.**—*Amer. Rose Annu., 1938*, pp. 142–148, 1938.

Coniothyrium fuckelii [*Leptosphaeria coniothyrium*], the agent of stem and graft cankers on roses in the United States [*R.A.M.*, xvii, p. 459], has not proved amenable to direct control by fungicides, but excellent results have been obtained by careful pruning and the excision of the cankers at the node below the visibly diseased area. In grafting it is important to cut the scions so as to avoid leaving stubs above the nodes. Of 799 grafts with scions having less than $\frac{1}{4}$ in. stem above the leaf axil only 0·3 per cent. developed canker at the tops of the scions, whereas of 76 with more than $\frac{1}{4}$ in. 12 per cent. contracted infection. In a test where care was taken to cut close to the node, there was only 0·8 per cent. infection at the tops of the scions in 10,149 grafts on three varieties, and 1·7 per cent. at the union.

Chester (K. S.). **Cucumber mosaic in greenhouse Petunias.**—*Plant Dis. Reptr*, xxii, 5, pp. 81–82, 1938. [Mimeographed.]

In December, 1937, several hundred young potted *Petunia* trans-

plants in a greenhouse in Oklahoma showed almost 100 per cent. mosaic, the symptoms varying in severity but resembling those of tobacco mosaic and consisting of green mottling with conspicuous stunting. When young Turkish tobacco plants were inoculated with the virus no clearing of the veins occurred until the eleventh day. Sub-inoculations from these tobacco plants and inoculations from the affected *Petunia* plants to *Nicotiana glutinosa* produced a systemic disease, but not the local lesions characteristic of tobacco mosaic. Inoculations from the *Petunia* plants to young cowpeas produced the small, punctate, local necrotic lesions characteristic of cucumber mosaic. In view of all these facts, the *Petunia* virus is considered to be a strain of cucumber mosaic.

With reference to control, it is pointed out that whereas *Petunia* plants affected with tobacco mosaic would not be a danger to greenhouse cucurbits in the vicinity, the plants in question would.

BOISCHOT (P.). **Le Jasmin.** [Jasmine.]—*Progr. agric. vitic.*, cix, 17, pp. 399–401, 1938.

The chief fungal disease of jasmine in France is root rot, caused by *Rosellinia aquila* and *R. necatrix* [*R.A.M.*, xiv, p. 62; xvi, p. 454] in association. Hitherto large doses of iron sulphate have been used as a preventive, but without much success. The author states that the disease can be reduced to the minimum by planting jasmine on a well-drained soil that contains no organic matter, such as decomposing trunks or roots or plant debris. *R. aquila* and *R. necatrix* occur abundantly in argillaceous soils which maintain a high water content in winter. The disease is not to be feared in the region of Pégomas (valley of the Siagne), where the soil is very permeable, but is very common in the vicinity of Grasse.

STAPP (C.). **Der bakterielle Erreger einer Blattfleckenkrankheit von Begonien und seine Verwandtschaft mit Pseudomonas campestris, dem Erreger der Adernschwärze des Kohls.** [The bacterial agent of a leaf spot disease of Begonias and its relationship with *Pseudomonas campestris*, the agent of vein-blackening of Cabbage.]—*Arb. biol. Anst.* (*Reichsanst.*), *Berl.*, xxii, 3, pp. 379–397, 9 figs., 1938.

From begonia leaves from various parts of Germany affected by a disease similar to that previously reported from Denmark, Holland, and Germany [*R.A.M.*, xvi, p. 320], the writer isolated in pure culture on various nutrient media a motile, predominantly uni-, occasionally biflagellate, Gram-negative, non-acid-fast, rod-shaped cylindrical organism composed of both rough and smooth forms, producing on bouillon agar yellow, transparent, butyrous colonies reaching a diameter of 2 to 2·5 mm. in four days, liquefying gelatine, peptonizing milk, making moderate growth in Uschinsky's solution but none in Fermi's or Cohn's, utilizing glucose, saccharose, lactose, glycogen, amygdalin, asparagin, peptone, urea, A-alanin, leucin, tyrosin, and (less freely) other sources of carbon and nitrogen, vigorously hydrolysing starch, reducing nitrates slightly, and forming hydrogen sulphide in 10 per cent. peptone solution. The organism developed more profusely at the alkaline range and increased the alkalinity of media to an end point of P_H 8·6 to 9·35, but

failed to grow (except for one smooth strain) at 4·4. The minimum, optimum, and maximum temperatures for development were 1° to 5°, 28° to 30°, and 42° to 43° C. with a thermal death point between 49° and 50°. The constancy of the smooth and rough forms of the bacterium was not uniformly maintained in subcultures on bouillon agar, hence no undue importance should be assigned to the generally stronger pathogenicity of the rough strains in inoculation experiments [full details of which are given] on *Begonia alba* and Gloire de Lorraine, Konkurrent, and Baardze's Favourite varieties.

In morphological and physiological characters the begonia organism, originally designated by Buchwald in Denmark *Bact. begoniae* [ibid., xiii, p. 308], corresponds fairly closely with *Pseudomonas campestris*, the agent of black rot of cabbage, but there was no serological agreement between the two, and, moreover, *P. campestris* is not pathogenic to begonias, so that there is evidently no question of identity. It is accordingly proposed to name the begonia organism *Pseudomonas begoniae* (Buchwald) n. comb., of which *Phytomonas flava begoniae* Wieringa [ibid., xv, p. 229] and *Bact. flavozonatum* McCulloch [ibid., xvi, p. 613] are regarded as synonyms.

Fikry (A.). **Rust pustules on roots of Antirrhinum.**—*Ann. Bot., Lond.*, N.S., ii, 6, pp. 536–537, 1 fig., 1938.

Attention is drawn to the occurrence of teleutosori of *Puccinia antirrhini* on the root system of some *Antirrhinum* [*majus*] plants severely attacked by the rust in Egypt [*R.A.M.*, xvi, p. 387; xvii, p. 396].

Mains (E. B.). **Host specialization in Coleosporium solidaginis and C. campanulae.**—*Pap. Mich. Acad. Sci.*, xxiii, pp. 171–175, 1938.

Three years' experiments near Ann Arbor, Michigan, in which isolations of *Coleosporium solidaginis* [*R.A.M.*, xiv, p. 364] from *Solidago canadensis*, *Pinus resinosa*, and *Aster novae-angliae* were cross-inoculated on a large number of Compositae, indicate that this species consists of various physiological races. Species of *Aster* were not infected to any appreciable extent by the *Solidago* rust, and conversely species of *Solidago* were resistant to the *Aster* rust. The rust from *S. canadensis* and *P. resinosa* infected species of *Solidago*, but not all in the same manner. *S. ohioensis* and *S. rigida* were resistant to the rust from *S. canadensis* but very susceptible to that from *P. resinosa*. The results of inoculations of numerous species of *Campanula* with *Coleosporium campanulae* [ibid., xvii, p. 278] from *Campanula americana* did not completely agree with those obtained with any of the European specialized forms, and it is concluded that this rust is an additional specialized form. The variations observed in several of the species of *Campanula*, especially *C. rapunculoides*, seem to indicate that these plants are not necessarily genetically uniform for rust reaction. Apparently there exists in these two rusts as complicated a situation as in the cereal rusts. It is suggested that accurate comparisons of the reaction within a host species will only be possible when strains of host species genetically identical for rust reaction are employed in the investigations, although the possibility of the isolation and the maintenance of such

strains appears to be doubtful and could only be attempted where justified by the economic importance of a particular rust.

BUCHWALD (N. F.). **Berberis-Arternes Modtagelighed for Sortrust (Puccinia graminis).** [The susceptibility of *Berberis* species to black rust (*Puccinia graminis*).]—Reprinted from *Gartnertidende, 1937*, 5 pp., 2 figs., 1937. [Received July, 1938.]

The writer tabulates and discusses in the light of recent investigations the relative susceptibility to *Puccinia graminis* of a number of species of barberry occurring in Denmark (according to the catalogues of reputable nurseries and the Scandinavian horticultural lexicon). From these investigations it would appear that, in general, the evergreen varieties belonging to the sections *Buxifoliae*, *Ilicifoliae*, and *Wallichianae*, with their thick leaves of leathery consistency, are resistant, whereas the thin-leaved, deciduous species of the *Vulgares* section, including the familiar *Berberis vulgaris* and its var. *atropurpurea*, are highly susceptible. Absolute immunity from *P. graminis* appears to be a feature of *B. thunbergii* and its vars. *atropurpurea* and *minor* of the section *Sinensis* as well as of *B. concinna* (*Angulares*) and *B.* (*Mahonia*) *repens*; other representatives of *Sinensis*, however, e.g., *B. chinensis* and *B. canadensis*, are susceptible. *Mahoberberis neubertii*, a hybrid between *B. vulgaris* and *Mahonia* [*B.*] *aquifolium*, is also generally susceptible, but individual reaction varies, while *B. bealii* is only slightly attacked.

MCWHORTER (F. P.). **The antithetic virus theory of Tulip-breaking.**—*Ann. appl. Biol.*, xxv, 2, pp. 254–270, 2 pl., 1938.

This is an account of four years' experiments to test the theory that tulip 'breaking' [*R.A.M.*, xvii, p. 459] results from the presence within the plant of two distinct and antithetic viruses, the colour-removing virus I and the colour-adding virus II, as first formulated by the author in 1931 [ibid., xii, p. 292]. Using the same inoculation method as in previous work with a mosaic of irises [ibid., xvi, p. 254] the author injected healthy tulip plants either with viruses from plants exhibiting full break (virus I), self break (virus II), or measured mixtures of the two. The symptoms produced by these injections, measured in terms of growth and colour response, confirmed the view that the viruses are antithetic, virus I being dominant. The commercial broken tulips are stated to represent responses to physiologically balanced mixtures of the two viruses. Some of the red varieties proved incapable of breaking white or full, apparently owing to the presence of a factor inhibiting the action of virus I.

CALDWELL (J.) & JAMES (A. L.). **An investigation into the 'stripe' disease of Narcissus. I. The nature and significance of the histological modifications following infection.**—*Ann. appl. Biol.*, xxv, 2, pp. 244–253, 2 pl., 2 diags., 1938.

The symptoms of the stripe disease of *Narcissus* [*R.A.M.*, xiv, p. 366; xvi, p. 728, and next abstract] are stated to vary so widely that doubt is expressed as to whether only one pathogen is involved. Discoloration of the foliage and flower stalks usually occurs, but both shape and

colour of the affected areas vary with different host varieties. There are two main types of discoloration, one ranging from slightly yellowish-green to bright yellow, occurring either as longitudinal stripes of variable length and width or as mottling, which frequently covers a large part of the leaf surface; the other type is silver-grey, in longitudinal stripes running along practically the entire length of the leaf; light streaks or patches appear in the flowers of some varieties. Longitudinal corrugations are formed on the surface of leaves of some varieties; they are very prominent in Czarina, while in other kinds they remain small and inconspicuous. Some of the 'trumpet' varieties, especially King Alfred [daffodils], become severely distorted and often bent through a wide angle; minor distortions of flower stalks and leaves are not uncommon. In the absence of any technique for artificial transmission of the disease the authors investigated the changes in the internal structure of diseased plants collected from bulb fields and gardens and found that all types of symptoms were produced, in all varieties examined, by three factors in varying degrees of relative intensity. These factors were (1) destruction of chlorophyll, causing discoloration, (2) a stimulus to cell division in the epidermal and palisade tissues of the leaf and the flower stalk, and (3) a stimulus to growth of individual cells in the same tissues. Although the causal agent of the stripe disease still remains unknown, the results of the investigations are suggestive of a virus complex consisting of at least three components, which are all present in a diseased plant, but are not uniformly distributed throughout the diseased tissues, while the different behaviour of individual cells gives the impression that they can exist separately. Large bodies resembling X-bodies have been found in the cells, lying close to the nucleus.

Van Slogteren (E.). **The transmission of virus diseases in Daffodils.**—*Chron. bot.*, iv, 3, p. 205, 1938.

Evidence has been obtained in Holland by De Bruyn Onhoter that yellow stripe or mosaic disease of daffodils [*Narcissus pseudo-narcissus*: see preceding abstract] is transmissible by grafting two bulbs together and also by introducing expressed sap of diseased foliage into healthy leaves, the inoculated plants developing typical symptoms the following season. Out of about 1,000 control plants of the stock used not one bulb has shown any symptom of disease, while in some of the experiments 50 per cent. of positive results were obtained. Most of the stock used in the experiments consisted of healthy daffodils of the Sir Watkin variety, kept under control for two years and proved free from any mosaic symptom. Typical disease followed infection with sap from diseased plants of the Sir Watkin, Croesus, van Sion, Krelage, and Talma varieties. The inoculations were made in the open field from 4th March to end of April, and on 2nd June, 1937; no positive result was obtained from inoculations made between 4th and 17th March or in June.

Ark (P. A.), Tompkins (C. M.), & Smith (R. E.). **A bacterial bud and stem rot of Rocket Larkspur.**—*Phytopathology*, xxviii, 4, pp. 281–283, 1938.

Apart from some minor cultural differences in the sugar utilization

and fermentation processes, the organism isolated from rocket larkspurs (*Delphinium ajacis*) suffering from bud and stem rot in California agrees with *Erwinia phytophthora* [*R.A.M.*, xvii, p. 44]. The disease, which is characterized by extensive foliar chlorosis, stem-blackening, general stunting, and rotting of the succulent tissues, was shown to be transmissible by aphids (*Macrosiphum solanifolii*) from infected to healthy plants in a limited number of tests. Inoculation experiments gave positive results on a number of *Delphinium* species, including *D. consolida* and varieties of various colours raised from seed, as well as on carrot roots and potato tubers. Ten minutes' immersion of the seed in water heated to between 50° and 55° C. gave effective control of the disease.

HENRY (A. W.), CLAY (S. B.), & FRYER (J. R.). **Organic mercury fungicides and disease resistance in the control of Slender Wheat Grass smut.**—*Canad. J. Res.*, Sect. C, xvi, 5, pp. 195–202, 1938.

In the course of the authors' field experiments on seed treatment with fungicidal dusts for the control of the smut disease of *Agropyron pauciflorum*, originally identified as *Ustilago bromivora*, and later included by Fischer in the composite species *U. bullata* [*R.A.M.*, xvii, p. 505], the disease was completely controlled by treating the naturally or artificially smutted seed with ethyl mercury phosphate (new improved ceresan), methyl mercury nitrate (leytosan), or methyl mercury phosphate (leytosan P.), with mercury equivalents of 3·8, 1·5, and 3 per cent., respectively, each applied at a rate of ½ oz. per bush. None of the treatments caused appreciable injury to the seed after storage for one year. Application at higher rates gave equally satisfactory control but decreased the percentage of emergence. Treatment with a 50 per cent. copper carbonate dust was not effective. Although satisfactory control has so far been obtained by the wet formaldehyde treatment, the authors recommend the dry dust treatment as more convenient, quicker, and more suitable for use in advance of seeding time. In resistance tests with seeds from several collections of wild plants of *A. pauciflorum* and of hybrids between *A. pauciflorum* and *A. subsecundum*, artificially inoculated with smut at Edmonton, a considerable proportion appeared to be immune or highly resistant, and may serve as parental material for breeding resistant or immune varieties. The variety Fyra, an improved variety of slender wheat grass developed at the University of Alberta, was found to be highly resistant to, but not immune from smut. Until immune varieties are developed and generally distributed the continuance of seed treatment is advocated.

TURNBULL (J.). **Fruit tree spraying in 1937.**—*J. Minist. Agric.*, xlv, 1, pp. 16–22, 1938.

During 1937 sprays with triple and quadruple nozzles were tried out on a number of farms, paying special attention to Bramley's and Lord Derby apples [cf. *R.A.M.*, xvi, p. 547], and the following conclusions drawn from the results. For bush trees and fruit bushes spraying with 2 ft. lances with double nozzles from a central plant or through portable pipes is recommended; for half-standard trees a 4 ft. or occasionally

a 6 ft. lance with a triple nozzle with a 15° bend and 4/64 in. disks is preferable, and for very large trees, requiring 350 to 400 gals. per acre of summer wash, a 4-nozzle head without a bend, on a lance not longer than 4 ft., is most suitable, given sufficient pressure. A mobile outfit can carry one or two lances with 3 or 4 nozzles each. In all cases nozzle pressures of 350 to 500 lb. and 200 to 250 lb. require 4/64 in. and 5/64 in. disks, respectively. Seven-hole swirl plates are needed for a long drive, but six-hole plates are better for close work. This type of spray is unsuitable in strong wind, when it fails to reach the tops of the trees.

McKay (R.). **Conidia from infected bud-scales and adjacent wood as a main source of primary infection with the Apple scab fungus Venturia inaequalis (Cooke) Wint.**—*Sci. Proc. R. Dublin Soc.*, N.S., xxi, 54–59, pp. 623–640, 1 pl., 1938.

The author points out that two sources of infection have so far been held mainly responsible for primary infection of apple trees with apple scab (*Venturia inaequalis*) [*R.A.M.*, xvii, pp. 465, 533], viz., conidia from one-year-old wood, and ascospores from dead leaves of the previous season. In the course of his observations at Glasnevin in 1937, however, the disease was found to develop on several varieties of apple trees in the absence of both scabbed wood and dead leaves, infection from February onwards having been traced to diseased bud scales and the adjacent tissue. In January a microscopic examination of dormant buds of unsprayed Bismarck and Bramley's Seedling, both free from external evidence of infection, showed that 53 and 49 per cent. of the buds, respectively, contained viable scab mycelium in the scales and the woody tissue at their bases. Examination of 26 further varieties of apple trees revealed the presence of infected bud scales and bases, no scabbed wood being present in ten cases. Infected bud scales were found mainly on blossom, but also on foliage buds, the scab pustules developing usually on the outside of the bud scale, but occasionally also on the inner surface; in one instance a pustule was found on the pedicel of the blossom truss within the bud. Sporulation occurred naturally during the second week in February, but the majority of infected bud scales produced conidia from the middle of April to the end of June, though this activity could seldom be detected without the microscope. On the new buds the first infected scales were observed on the 3rd July, showing visible black lesions, and the last on the 29th September. The first infected foliage was found in May, 1937, on a tree severely attacked in the previous year, and many similar small groups of diseased leaves were later found on others, the infection being confined in all cases to the oldest leaves, and amounting to at least 50 per cent. of the whorl. The neighbouring foliage remained healthy and the infection arose principally in the region of the buds, which were found to possess infected bud scales. Very little spread of infection occurred from tree to tree. A distinct correlation was found to exist between the amount of scab in 1936 and the percentage of infected buds in the following winter, which in turn was directly related to the early appearance of the disease. For the successful control of apple scab two pre-blossom sprays are recommended for severely

scabbed trees, while one spray is considered sufficient for mild cases, and attention is drawn to the importance of controlling outbreaks of the disease late in the season, thus keeping the foliage healthy and preventing ascospore development as well as the infection of the bud scales.

NUSBAUM (C. J.) & KEITT (G. W.). **A cytological study of host-parasite relations of Venturia inaequalis on Apple leaves.**—*J. agric. Res.*, lxvi, 8, pp. 595–618, 3 pl., 4 figs., 1938.

This is a full report of the authors' cytological studies of the entry and development of *Venturia inaequalis* in the leaves of Fameuse, Yellow Transparent, and Missouri Pippin apples, inoculated with two monoconidial strains of the fungus, an abstract from which has already been noticed from another source [*R.A.M.*, xv, p. 513]. In addition to the information formerly given, it is stated that spore germination, formation of appressoria or functionally equivalent structures, and the direct penetration of the cuticle occurred in all cases, without being perceptibly influenced by the combinations of isolate (fungus strain) and apple variety. It was shown, however, that in suitable isolate-variety combinations the fungus, though confined to the subcuticular region, is able to derive its nourishment efficiently from the underlying host tissues, and to produce a wide range of pathological effects in them. It is further believed that the observed variation in host-parasite reaction is due partly to differences in the degree and partly to differences in the kind of phenomena concerned, and that the use of a wider range of biotypes of host and parasite would increase the range of this variation. In its mode of penetrating the cuticle, diversity of isolate-variety reactions, and ability to subsist many weeks in balanced relations with the host, *V. inaequalis* is considered to resemble many obligate parasites.

DOUD (L. J.) & MCCOWN (M.). **Effect of spray materials applied in the blossoming period upon set of fruit of Grimes and McIntosh Apples.**—*Hoosier Hort.*, xx, 3, pp. 38–41, 1938.

Significant reductions in the set of Grimes apple fruits [cf. *R.A.M.*, xiii, p. 450] were caused by atomizing the open blossoms of thinned clusters with 2–6–100 Bordeaux mixture at the Department of Horticulture, Purdue University, Indiana, in 1935 and 1936 (41 and 16·7 per cent. respectively), but in 1937 no adverse effects followed the application by a power sprayer (400 lb. pressure) of the same preparation or wettable sulphur (6 lb. in 100 gals.) to unthinned clusters of Grimes and McIntosh. Russeting did not develop on the fruit treated with either fungicide. It is concluded that the value of these treatments in the control of fireblight [*Erwinia amylovora*] and scab [*Venturia inaequalis*] outweighs any crop reduction likely to result from spraying. [An account of this work also appears in *Proc. Amer. Soc. hort. Sci.*, xxxv, pp. 36–38, 1938.]

KADOW (K. J.) & ANDERSON (H. W.). **The value of new copper sprays as fungicides for the control of Apple blotch, Cherry leaf spot, and Apple scab—1937.**—*Phytopathology*, xxviii, 4, pp. 247–257, 2 figs., 1 graph, 1938.

A detailed, tabulated account is given of experiments on the control

of apple blotch (*Phyllosticta solitaria*) [*R.A.M.*, xiii, p. 450], cherry leaf spot (*Coccomyces hiemalis*) [ibid., xvii, p. 328], and apple scab (*Venturia inaequalis*) by the application of some new copper-containing fungicides in Illinois in 1937, when ideal conditions obtained both for the development of the diseases under observation and for spray injury by water-soluble chemicals.

Blotch on Duchess apples was satisfactorily combated without spray injury by the following preparations (concentrations in 100 gals.): Bordeaux '34' (General Chemical Co.) 2 lb., with $\frac{3}{4}$ lb. each of zinc sulphate and lime, oxo-Bordeaux [ibid., xvi, p. 544] (Ansbacher-Siegle Corp.) 6 lb., copper zeolite [ibid., xvi, p. 764] 3 lb., and copper hydro 40 (copper hydroxide) [ibid., xvii, p. 541] from the Chipman Chemical Co. Cupro-K (copper oxychloride) from Röhm and Haas is recommended for further testing at 3 lb., since the 4 lb. concentration represented the borderline of safety, causing slight specking of the fruit. Further consideration should also be paid to copper phosphate (4 lb.) [ibid., xvii, p. 401] plus lime (6 to 8 lb.) and bentonite (4 lb.), which controlled all phases of blotch, except on the petioles, at half the above strength without injuring the trees or fruit. Other materials controlling blotch but damaging either the foliage or fruit, or both, were cuprocide 54 (containing cuprous oxide) from Röhm and Haas [ibid., xvii, p. 219], basi cop (basic copper sulphate) from the Sherwin-Williams Co. [ibid., xvii, p. 502], Bordeaux mixture, 'special copper' supplied by the Niagara Sprayer and Chemical Co., and coposil [ibid., xvii, p. 447 *et passim*], consisting of copper calcium and copper zinc silicates [cf. ibid., xiv, p. 591] from the Californian Spray Chemical Co.

Cherry leaf spot on the Montmorency, Early Richmond, and Dyehouse varieties proved less amenable than apple blotch to control by the test preparations, possibly on account of the lower concentrations of the latter recommended by the proprietors and the fewer applications given. The most promising results were secured with Bordeaux '34' ($1\frac{1}{2}$ lb.) plus zinc sulphate and lime ($\frac{1}{2}$ lb. each), cupro-K (2 lb.), and liquid lime-sulphur (2 gals.). Copper hydro 40, coposil, basi cop, and the Niagara special copper also gave good control, but the risk of injury to the trees must be minimized before they can be taken into general use.

All the above-mentioned copper preparations gave good control of apple scab, but their inclusion in the spray schedule cannot be advocated on account of the injury likely to be inflicted on such varieties as Jonathan, Winesap, Ben Davis, and Delicious under local conditions.

[A report of these experiments by H. W. Anderson, K. J. Kadow, and D. Powell, somewhat abridged in respect of apple blotch and cherry spot data, but giving further details of the apple scab results, appears in *Trans. Ill. hort. Soc., 1937*, lxxi, pp. 255–269, 1938.]

Crawford (R. F.). **Apple measles.**—*Bull N. Mex. agric. Exp. Sta.* 251, 15 pp., 3 figs., 1937. [Abs. in *Exp. Sta. Rec.*, lxxviii, 4, p. 505, 1938.]

Apple measles [*R.A.M.*, xvii, p. 400], discovered in New Mexico in 1918 and then reported as being prevalent and destructive, is most important in this locality on the Jonathan variety. The affected trees may be dwarfed and, if young, killed, and the fruit is small and poor.

Fungi isolated from affected tissues are regarded as being only associated with the disease, and not its cause. Inoculation of juice from affected into healthy tissue, as well as various types of grafting, gave no indication of the action of fungi or bacteria, and no organism was observed in histological preparations. The condition is most prevalent on soils with a high soluble salt content and in neglected orchards. Soils round affected trees were ascertained to have a soluble salt content up to 6,000 p.p.m.; measles was induced on Jonathan trees by growing them in soil with a soluble salt content of 4,000 to 6,000 p.p.m. Trees planted in soil containing 1,000 to 4,000 parts of salt per million developed marked symptoms of the condition in one season, while the controls in a soil of low soluble salt content remained normal. The alkalinity of most local soils may be a contributory factor. It is concluded that measles would appear to be a physiological condition influenced by a high soluble salt content in the soil.

Lutz (J. M.) & Culpepper (C. W.). **Certain chemical and physical changes produced in Kieffer Pears during ripening and storage.**—*Tech. Bull. U.S. Dep. Agric.* 590, 37 pp., 2 figs., 10 graphs, 1937.

In the section of this bulletin dealing with the development of decay in Kieffer pears from various parts of the United States during the processes of ripening and storage, temperatures of 70° to 80° F. are stated to have been particularly conducive to rotting, chiefly due to *Rhizopus* [*R.A.M.*, xvi, p. 518], in 1932 and 1933. A temperature of 60° produced more decay than one of 50°, but ripening was more rapid at the former. The amounts of severe rot after 20 days in the ripening room at 50°, 60°, 70°, 80°, 90°, and 100° were 0, 5·8, 39·3, 17·2, 0, and 1·3 per cent., respectively, the corresponding figures for moderate infection being 2·4, 12·8, 13·1, 8, 4·8, and 1·3, respectively, slight 10·7, 11·6, 1·2, 6·9, 4·8, and 6·3, respectively, and sound fruit 76·2, 52·3, 4·8, 2·5, 32·8, and 79·7 per cent., respectively.

Leib (E.). **Eine wenig beachtete Zwetschenkrankheit.** [A little heeded Plum disease.]—*Kranke Pflanze*, xv, 4, pp. 66–67, 1938.

In 1937 plum pockets (*Taphrina pruni*) [*R.A.M.*, xvi, p. 330], a disease of rare occurrence under German conditions, broke out in epidemic form in the western Saar, and caused an 80 per cent. crop reduction in various parts of the Saarbrücken district. In addition to thorough orchard sanitation it may be necessary to replace the affected trees by such resistant varieties as Bühlertal, Zimmer's, Ersing, and Ebersvier.

Cochran (L. C.) & Smith (C. O.). **Asteroid spot, a new virosis of the Peach.**—*Phytopathology*, xxviii, 4, pp. 278–281, 2 figs., 1938.

The name 'asteroid spot' is applied to an apparently new transmissible virus disease of peaches, first observed in 1934 at the California Citrus Experiment Station and characterized by small, star-shaped, chlorotic splotches scattered singly over the leaf surfaces and presenting the aspect of spatterings from a thick, yellow liquid. As soon as the discoloration begins to spread to the tissue surrounding the spots, abscission layers are formed and the affected leaves are shed. In green-

house experiments in which J. H. Hale nursery trees were grafted with diseased scions the typical symptoms of asteroid spot began to show after eight weeks and developed at varying rates, one tree being rapidly destroyed while in others several branches below the grafts were invaded and the older leaves shed by the end of five months. The trouble is regarded as a potentially serious peach disease, which should be handled only under controlled conditions.

MECKSTROTH (G. A.). **Relation of temperature to fall damage of Strawberries by leaf scorch.**—*Plant Dis. Reptr*, xxii, 3, pp. 56–57, 1938. [Mimeographed.]

In the late autumn of 1936, G. M. Darrow and E. B. Morrow found that Klondike strawberries in North Carolina were suffering excessively heavy damage from leaf scorch (*Diplocarpon earliana*) [*R.A.M.*, xvi, p. 394], the percentages of leaf area destroyed by the fungus in the best and worst parts of one particular field being 93 and 96 per cent., respectively (*Plant Dis. Reptr*, xxi, p. 71, 1937). Counts made in the same field on 21st April, 1937, showed that the average numbers of leaves, berries, and buds and blossoms (including blossoms killed by frost) per plant were 5·7, 3·2, and 7·8, respectively, for the scorched and 9·8, 8·4, and 15·6, respectively, for the healthy. The principal contributory factor in the autumn leaf scorch epidemic of 1936 is thought to have been the abnormally high temperatures prevailing from July to November, especially during October, when the mean reached 65·5° F., the optimum for the development of *D. earliana* being 72° to 80°.

British West Indies Fruit and Vegetable Council. Report of the First Joint Meeting of the Eastern and Western Group Councils and of the Third Meeting of the Eastern Group Council held at the Imperial College of Tropical Agriculture, Trinidad, February, 1938.—61 pp., Govt Print. Off., Port-of-Spain, Trinidad, 1938.

The following items of phytopathological interest occur on pp. 12–13 of the report. F. E. V. Smith, representing the Department of Agriculture, Jamaica, stated that banana leaf spot (*Cercospora musae*) [*R.A.M.*, xvii, pp. 404, 473] was most destructive under certain soil and climatic conditions conducive to seasonally vigorous or spasmodic growth. In typical first-class banana soils in the main cultivation centres of the Island, where steady growth was maintained and firm leaves produced, the disease, though present for at least 18 months, had caused no appreciable damage. The regular application of Bordeaux mixture by efficient methods on large estates constituted a serious problem, and it was doubtful whether any but the best-producing areas could bear the additional cost of $15.00 or more per acre per annum.

C. W. Wardlaw, of the Low Temperature Research Station, Imperial College of Tropical Agriculture, Trinidad, also emphasized the ecological background of *C. musae*, which in some districts rapidly assumed epidemic dimensions, whereas in others normal production continued, at any rate for a time, notwithstanding the presence of the fungus. Thus, during the first two years of inspection, the incidence of the disease in certain superior Trinidad soil types showed no marked tendency to

increase, thereby creating a deceptive impression of comparative unimportance which was corrected in the following season by the epidemic development of infection. This period of slow spread, during which no active control measures can be taken, represented one of the most difficult aspects of leaf spot. The collection of banana types at the Imperial College of Agriculture included a number of resistant strains, and it was reasonable to assume that the susceptible Gros Michel could be replaced.

E. E. Cheesman, Professor of Botany at the Imperial College of Agriculture, discussing the problems of plant breeding in relation to disease resistance, reported the introduction of certain wild banana types resistant to both Panama disease [*Fusarium oxysporum* var. *cubense*] and leaf spot. A variety, I.C.2, had also been produced for breeding purposes [ibid., xvii, p. 331] with adequate commercial qualities though not equal to Gros Michel in the latter respect. A search must now be made within the genus *Musa* for a male parent uniting the character of disease resistance with other desirable features.

GRANCINI (P.). **Il cancro del Fico da 'Phomopsis'.** [Fig canker due to *Phomopsis*.]—*Riv. Pat. veg.*, xxviii, 3–4, pp. 103–114, 6 figs., 1938.

Since 1924, fig trees at Santo Colombano, Italy, have been killed off in large numbers as a result of canker due to *Phomopsis cinerescens* [*R.A.M.*, v, p. 470]. The disease appears to have been aggravated by the severe winters of 1929 and 1931. Trees growing under good cultural conditions showed much stronger resistance than those grown too thickly together and inadequately manured. Frost was a predisposing factor, most of the cankers appearing on the site of cracks caused by the inclement weather. Control consists in increasing the vigour of the trees by improved cultural practices. Wilted branches (whether showing the presence of the fungus or not) should be removed, and the wounds disinfected. Spraying at the end of winter with Bordeaux mixture (3 to 4 per cent.) should be tried, and nursery cuttings should be taken from those trees that show resistance.

HOPKINS (J. C. F.). **A black rot of Papaw fruit caused by Phoma caricina sp. nov.**—*Trans. Rhod. sci. Ass.*, xxxv, 2, pp. 128–131, 1 pl., 1 fig., 1938.

Papaw fruits in Southern Rhodesia are commonly affected both on the trees and in storage by a rot which begins as a small, circular, water-soaked spot on the half-grown green fruit. The rot spreads, the affected tissues becoming much depressed, jet-black, and tough, and bearing partially erumpent pycnidia, from which long, hyaline tendrils of spores are extruded.

From diseased material a fungus was isolated with black carbonaceous, spherical, ostiolate, submerged pycnidia later becoming erumpent, but never superficial, 90 to 220 by 70 to 190 (average 112 by 129) μ, and hyaline, ovoid, ellipsoid, and allantoid conidia measuring 8 to 12 by 3 to 4 μ, extruded in long, pinkish, coiled tendrils. The fungus is named *Phoma caricina* n. sp. [with a Latin diagnosis]. Inoculations of green papaw with an aqueous suspension of the conidia, both with

and without surface injury, gave rise in each case to a typical rot, from which the fungus was reisolated.

CALVINO (EVA M.). **Funghi parassiti e saprofiti della Persea drymifolia.** [Fungi parasitic and saprophytic on *Persea drymifolia*.]—*Costa azzur. agric.-flor.*, xviii, 3–4, pp. 54–59, 2 figs., 1938.

Notes are given on a number of fungal diseases affecting avocado (*Persea* [*americana* var.] *drymifolia*) at San Remo. The most serious is a wilt, which attacks the leaf apices, where it produces a reddish-brown, triangular area which, on leaves exposed to the north, spreads along the margin and thence into the veins, and finally reaches the petiole. A grey area appears within the reddish discoloration at the leaf tip, together with rusty areas bounded by concentric circles. Acervuli are found on the lower surface. When practically all the leaves have become affected defoliation sets in, and the young branches and inflorescences may be attacked, and rapidly wither, infection then spreading to the older branches. Isolations from infected leaves yielded a *Gloeosporium* [cf. *R.A.M.*, iv, p. 653; v, p. 110; xv, p. 363] apparently distinct from *G. musarum*, and which the author names *G. perseae-drymifoliae* n. sp. ad interim [with a Latin diagnosis]. It is characterized by subepidermal, later erumpent, fuscous-black acervuli, 300 to 500 μ in diameter, hyaline, septate, erect conidiophores 6 to 8 μ long, acrogenous, hyaline, ellipsoidal or obovate, often curved conidia with a round apex, and measuring 22 to 32 (usually 24 to 26) by 8 to 10 μ. A variant on the fruits of avocado, with conidia measuring up to 8 to 12 by 3 to 4 μ, is named *G. perseae-drymifoliae* var. *fructigena*.

The susceptibility of the fruits to infection varies greatly with the variety, those with a tough epicarp remaining unaffected, even when the leaves are attacked. The cracks developing in diseased fruits become invaded by *Cladosporium herbarum*. Control consists in removing the fallen leaves and spraying the plants with 1 per cent. copper-lime before the flower buds open and until after they have expanded.

In the leaf and inflorescence traces of the same host the author found an apparently new species of *Pestalozzia* [cf. ibid., xv, p. 487] with conidia measuring 32 to 40 by 6 to 7 μ, which she names *P. perseae-drymifoliae* n. sp. [with a Latin diagnosis].

Other records on avocado are *Colletotrichum gloeosporioides* [ibid., xiv, p. 707], *Hendersonia sarmentorum*, *Ascochyta* sp., and *Phyllosticta perseae*. The paper concludes with a list of other diseases of avocado found in tropical regions.

BERTIN (C.). **Les mouillants agricoles.** [Agricultural wetters.]—*Progr. agric. vitic.*, cix, 17, pp. 396–399, 1 graph, 1938.

After briefly discussing the value of wetting agents in spray mixtures used on vines and emphasizing the importance of determining the proper quantity to be added, the author points out that certain French dealers greatly underestimate the proper dosage, the figure in some instances being determined by adding the wetter to water only or by tests made on dead plant cells. His own tests are made with a mixture containing 2 kg. copper sulphate and 1 kg. lime per hectol. water. When the mixture and wetter together have been filtered, a total of 130 drops per

5 c.c., as determined by Duclaux's drop-counter, demonstrates, in his opinion, that the wetting agent is perfectly reliable for ordinary purposes when used on any variety of vine and at any hour of the day.

WILLAUME (F.). **Deuxième contribution à l'étude de l'action photosensibilisatrice de quelques traitements antiparasitaires.** [A second contribution to the study of the photo-sensitizing action of some anti-parasitic treatments.]—*Rev. Path. vég.*, xxv, 2, pp. 94–110, 1 pl., 1 diag., 1938.

In this further, supplementary account of experiments in which copper-containing fungicides and insecticides were exposed to the rays of a Challonge and Lambrey hydrogen tube [*R.A.M.*, xv, p. 452; xvi, p. 625], the author states that the data obtained show that the absorption of the ultra-violet rays of sunlight by certain fungicides favours the assimilation of nitric nitrogen by the higher plants (4,000 to 3,400 Å), stimulates their growth (3,400 to 2,900 Å), increases their resistance to fungal infection (3,000 Å and under), increases the fungicidal effect of the preparations tested (3,000 Å and under), and aggravates their scorching properties (beyond 2,900 Å). Twenty-three bibliographical references are given.

VIDAL (V. A. C.). **Contribuição para o estudo quimico-analitico dos insecticidas e fungicidas.** [A contribution to the chemico-analytical study of insecticides and fungicides.]—*Rev. agron., Lisboa*, xxv, 3, pp. 235–243, 1 fig., 1937. [Received July, 1938.]

Details are given of the methods officially employed in Portugal for the determination of the water content and content of active chemical principles of a number of standard insecticides and fungicides. From a table showing the analytical data obtained it appears that Schloesing's mixture (used against wheat bunt, *Tilletia caries* and *T. foetens* [*R.A.M.*, xvi, p. 594]) contains 15·88 per cent. copper per 100 gm. of the product sampled. The copper oxychloride content of Caffaro powder [ibid., i, p. 66 *et passim*] is 27·02 per cent.

GRAM (E.). **Statens plantepatologiske Forsøg. 1913–1938.** [The State Phytopathological Service. 1913–1938.]—*Tidsskr. Planteavl*, xliii, 1, pp. 159–176, 2 figs., 2 graphs, 1938.

An account is given of the organization and functions of the Danish Phytopathological Service, with an outline of its history from its inception in 1913, as a branch of the Plant Cultivation Experiment Service, to the present day. Among the many activities of the Service may be mentioned its advisory, propaganda, and reporting work in connexion with plant diseases, its quarantine arrangements, and its analytical investigations of disinfectants, including plant protectives [*R.A.M.*, xvii, p. 332].

EWELL (A. W.). **Present use and future prospects of ozone in food storage.**—*Food Res.*, iii, 1-2, pp. 101-108, 1938.

The writer summarizes and discusses the use of ozone [*R.A.M.*, xvi, p. 18 and next abstracts] in the preservation of stored foodstuffs from fungal and bacterial contamination.

Both bacteria and moulds absorb moisture during growth. The faster growing of the two consumes so much of the available water that the development of the other is checked. A fall in temperature reduces bacterial growth much more than that of moulds. Below about 3° C. moulds grow much more rapidly than bacteria unless the latter have obtained an advantage by high initial infection, whereas above that temperature superficial spoilage is normally of bacterial origin. A heavy growth of mould appears in the course of a few weeks on beef free from severe initial bacterial infection at a temperature range of 1° to 3° and a humidity of 90 per cent. or more. Ozone is much more effective in checking moulds than bacteria, and with 'clean' meat at the above-mentioned temperatures it invariably defers the development of fungal contamination from about a fortnight to two months. The best procedure is a two-hour ozonization twice a day at a concentration of 2½ to 3 p.p.m.

Small fresh fruits, e.g., strawberries, raspberries, currants, and grapes (particularly of the sweet wine type), are specially liable to mould, and their storage period may be doubled by 2 or 3 p.p.m. of ozone applied continuously or for several hours daily, while a similar treatment is also beneficial in the case of apples, eliminating the disagreeable 'dead' odour frequently noticeable in stored fruit. The gas is further valuable in the preservation of butter, cream, fresh fish, and many vegetables, but its outstanding success has been achieved in egg rooms, where moulds [ibid., xvii, p. 322] increase rapidly in the very humid atmosphere necessarily maintained to counteract shrinkage from evaporation. A minimum of 0·6 p.p.m. ozone is required to prevent infection in reasonably 'clean' eggs, whereas for 'dirty' ones or those already contaminated a concentration of 1·5 p.p.m. is advisable. For the purpose of egg preservation a continuous supply of ozone is preferable to the intermittent introduction of the gas. Under these conditions eggs kept at —0·6° with a relative humidity of about 90 per cent. are indistinguishable after eight months' storage from those a few days old.

The paper concludes with a brief consideration of the shortcomings of the ozonization methods in current use and suggestions for their improvement.

ROGERSON (J. T.), CAMPBELL (W. D.), REID (W. D.), & NEILL (J. C.). **Practical sterilization of meat-wraps.**—*N. Z. J. Sci. Tech.*, xix, 11, pp. 697–700, 1 diag., 1938.

The ordinary method of sterilizing meat wraps (cotton stockinette and hessian jute) with heat-vaporized formalin gas having been shown to be entirely ineffective against bacteria and moulds [cf. preceding abstract] in New Zealand, other possibilities of sterilization by heat were explored. Empey's dry heat method (*J. Coun. sci. industr. Res. Aust.*, x, p. 57, 1937) proved impracticable for works use, since the temperatures required to destroy all the bacteria on the wraps were so high that risk of damage to the fabrics was incurred. It was ascertained by further experimentation, however, that complete disinfection could be secured by 30 minutes' exposure of the wraps to an air temperature of 205° F. in a saturated atmosphere. Details are given of the construction and operation of a chamber at the Longburn Freezing Works, in

which the method was tested with highly successful results, the cost of erection being £263 and the running costs 19*s.* 3½*d.* for the treatment of 2,000 to 3,000 bags.

PRESCOTT (S. C.) & TANNER (F. W.). **Microbiology in relation to food preservation.**—*Food Res.*, iii, 1–2, pp. 189–197, 1938.

This is a summary, supplemented by critical observations and suggestions, of some recent literature on the role of micro-organisms (including fungi) in the spoilage of stored foods, with special reference to those preserved by exposure to low temperatures or freezing [see above, p. 577].

BERGER (G.). **Contribution à la connaissance des parasites des plantes cultivées en Chaouia (Maroc).** [A contribution to the knowledge of the parasites of plants cultivated in Chaouia (Morocco).]—*Rev. Path. vég.*, xxv, 2, pp. 135–143, 1 pl., 1938.

Short, popular notes are given on 29 fungi found on market-garden crops (including flowers) in Morocco [cf. *R.A.M.*, xvii, p. 506].

HOFMANN (W. F.). **A review of work done on mildew prevention.**—*Amer. Paint J.*, xxii, pp. 22, 24, 58, 60, 1938. [Abs. in *Chem. Abstr.*, xxxii, 7, p. 2766, 1938.]

The effective concentrations against paint mildew [*R.A.M.*, xvii, p. 195] of mercuric chloride, cuprous oxide, mercuric oxide, sodium silico-fluoride, phthalic anhydride, and certain trade products are given. By the use of a high pigment concentration of hard-drying pigments, such as zinc oxide, trouble from this source has been reduced, while good results have also been obtained by the incorporation in the vehicle of a good spar varnish, producing a faster drying film with less time for spore attachment and a hard surface tending to repel the adhesion of these organs. Mildewed surfaces to be repainted should be scrubbed with trisodium phosphate or sodium carbonate solutions (1 lb. per gal. water), with the addition if necessary of a 1 : 600 solution of mercuric chloride. One or two coats of superior paint with a good spar varnish and a suitable fungicide are necessary.

HENDERSON SMITH (J.). **Some recent developments in virus research.**—*Ann. appl. Biol.*, xxv, 2, pp. 227–243, 1938.

In this presidential address to the Association of Applied Biologists the author discusses the problems of control of virus diseases and emphasizes two main means of achieving it: the sowing of clean material and keeping the crop clean through the period of growth. The use of clean seed usually ensures a virus-free crop, although this is disputed in the case of tomatoes and cucumbers, probably because the evidence for and against seed-borne infection has been based on work with different viruses. In the case of vegetatively propagated crops elaborate testing of the parent material is necessary; inspection of the potato crop, as practised in England, and the American system of tuber-indexing are fairly successful. The transmission of infection by insects constitutes the main problem in the control of virus diseases, but no practicable method of controlling the vectors has yet been devised. So far the only successful general method of control has been the breeding and selection

of resistant varieties, but recently a new method of immunization which is still in the experimental stage has been developed independently by several workers, of whom Salaman is stated to have been the first to realize its practical significance. A discussion follows on the nature of viruses, based mainly on the work of Stanley and Bawden and Pirie, and the author concludes with the observation that, although some of the viruses may be living organisms, it appears to be established that others are not.

Seiffert (G.). **Virus and Viruskrankheiten bei Menschen, Tieren und Pflanzen. Biologische Einführung in die allgemeinen Forschungsergebnisse, praktischen Anwendungen und Arbeitsmethoden.** [Virus and virus diseases of man, animals, and plants. A biological introduction to the general results of research, practical applications, and experimental methods.]—xii+221 pp., 7 figs., Dresden, T. Steinkopff, 1938. Rm. 16. [Abs. in *Zbl. Bakt.*, Abt. 1 (*Ref.*), cxxix, 23–24, p. 527, 1938.]

The general section of this treatise, stated by the reviewer to embody the latest results of virus research, deals briefly with the most important properties of the viruses and explains the fundamental principles underlying pathogenesis, immunity, protective inoculation, and epidemiology. The special section is devoted to individual virus diseases of man, animals, insects, and plants, and to the relationship between virus infection and tumours, while virus-like organisms and filterable bacterial forms are also discussed. The technique of virus studies is described in a short concluding chapter. A valuable feature of the manual is the full treatment of the relevant foreign literature, some of which is not readily accessible, while the question of the interpretation of viruses and the many unsolved problems of the diseases caused by this group of entities are handled in a stimulating manner.

Lynen (F.). **Das Virusproblem.** [The virus problem.]—*Angew. Chem.*, li, 13, pp. 181–185, 1 graph, 1938.

This is a survey of recent studies on the nature of viruses, including that of tobacco mosaic, reference to which has already been made in this *Review*.

Kausche (G. A.). **Über eine Trennungsmöglichkeit von Mischviren auf Grund ihrer differenten P_H Stabilität.** [On the possibility of separating mixed viruses on the basis of their differential P_H stability.]—*Naturwissenschaften*, xxvi, 14, p. 219, 1938.

Experiments were conducted at the Biological Institute, Berlin-Dahlem, to determine the practicability of separating the tobacco mosaic viruses from the X and Y potato mosaic viruses in mixed preparations, by varying the hydrogen-ion concentration of the sap [cf. *R.A.M.*, xvii, p. 544]. The potato mosaic viruses were found to be inactive at below P_H 3·2, and after seven days at P_H 1·5 only the tobacco mosaic virus remained active. At P_H 4·5 to 7·5 none of the viruses was affected. At P_H 9·9 the tobacco mosaic virus was inactivated in four days while the X virus of potato retained its full activity during the same period.

It is therefore possible to separate naturally and artificially mixed viruses by the method indicated, and it would seem that the potato mosaic viruses, which are sensitive to oxidation, might be protected from the catalytic action of heavy metals in the acid hydrogen-ion range by the introduction of complex-forming buffer substances.

VAN LUIJK (A.). **Antagonism of Penicillium spec. versus Pythium Debaryanum.**—*Chron. bot.*, iv, 3, pp. 210–211, 1938.

Investigations by the author showed that *Penicillium* spp., isolated from vegetable mould and grown in nutrient solutions, formed metabolic products which had a more markedly inhibiting effect on the growth of *Pythium de Baryanum* than those of any other organism tested. Proof was obtained that these substances are thermostable and are absorbed by kaolin and norit. The main factor determining their formation was the nature and concentration of the source of carbon, maltose causing the highest toxicity, though other mono- and disaccharides (except lactose) were also suitable. With organic nitrogen compounds the toxicity was very weak, while with polysaccharides it was intermediate. Cultures of *Penicillium* with 0·5 per cent. saccharose were toxic up to a dilution of 1 in 128, and with 4 per cent. saccharose up to 1 in 1,280, this latter figure being equivalent in toxicity to *P. de Baryanum* to 0·2 per cent. mercuric chloride. The toxic effect of *Penicillium* towards *Gibberella fujikuroi* was 200 times weaker than towards *P. de Baryanum*.

A damping-off of lucerne seedlings in unsterilized soil in a hothouse was completely arrested by a culture of *Penicillium*. After the inoculation of sterile soil in pots with *P. de Baryanum* up to 90 per cent. of lucerne seedlings in these pots were killed. When 12·5 c.c. of sterilized culture liquid of *Penicillium* were added to 200 c.c. of soil the development of *Pythium* was completely inhibited. This effect was not produced when the *Penicillium* culture or culture liquid was replaced by spores, probably owing to the absence of the suitable carbohydrates.

In pure culture *in vitro* the *Pythium* infection gave 100 per cent. positive results, but when 0·08 c.c. of sterilized *Penicillium* liquid was added the seedlings were as healthy as the controls.

It is considered that these growth-inhibiting substances may provide a basis for the disinfection of soil in pot cultures.

BAUER (R.). **Beiträge zur Physiologie von Dematium pullulans de Bary.** [Contributions to the physiology of *Dematium pullulans* de Bary.]—*Zbl. Bakt.*, Abt. 2, xcviii, 5–9, 133–167, 4 figs., 1 diag., 2 graphs, 1938.

This is a very detailed account, supplemented by 55 bibliographical references, of the author's study on the physiology of *Dematium* [*Pullularia*] *pullulans* de Bary isolated in 1931 from a sooty mould on an elm leaf.

The effects of different nutrient media, conditions of aeration, hydrogen-ion concentration, and neutral salt content of the medium on the growth of the fungus in culture are described, with particular reference to the relative amounts of mycelium and conidia produced, the forma-

tion of abnormal cells, of slime, and of melanin. The osmotic relations and the carbon and nitrogen metabolism of the fungus were also investigated, and are discussed at length.

SCHOPFER (W. H.) & BLUMER (S.). **Les facteurs de croissance des espèces du genre Ustilago.** [Growth factors in species of the genus *Ustilago*.] —*C.R. Acad. Sci., Paris*, ccvi, 14, pp. 1141–1143, 1938.

Of ten species of *Ustilago* supplied by the Bureau voor Schimmelcultures, Baarn, and grown on the synthetic medium used with such excellent results in the case of *U. violacea* [*R.A.M.*, xvii, p. 247], seven were found to be auxo-autotrophic, i.e., capable of attaining perfect development without the addition of an accessory growth substance, viz., *U. zeae*, *U. tritici*, *U. levis* [*U. kolleri*], *U. nuda*, *U. hordei*, *U. avenae*, and *U. bromivora* [ibid., xvii, p. 45] (both sexes). One species, though strictly speaking auxo-autotrophic, responded by a slight increase of growth to the addition to the nutrient medium of aneurin or the pyrimidin constituent alone, namely, *U. longissima* [ibid., xii, p. 88] (both sexes). One species, *U. violacea*, has already been shown to be auxo-heterotrophic in these experiments. *U. scabiosae* behaved similarly, making no appreciable growth in the absence of aneurin, attempts at the replacement of which by its two components, pyrimidin and thiazol, were unsuccessful. As in the case of the Mucorineae and other groups investigated, extracts of the autotrophic species were capable of inducing the development of the heterotrophic species on a synthetic medium.

KURSANOFF (L. I.) & MEDVEDEVA (Mme S. B.). К вопросу об эволюции паразитизма у грибов. I. Влияние *Chrysomyxa pirolae* Rostr. на строение и функции хозяина *Pirola rotundifolia* L. [On the evolution of parasitism in fungi. I. The influence of *Chrysomyxa pirolae* Rostr. on the structure and the functions of the host *Pirola rotundifolia* L.]—*Bull. Soc. Nat. Moscou, Sect. biol.*, N.S., xlvii, 2, pp. 119–130, 1938. [French summary.]

The relation between the [spruce] rust *Chrysomyxa pyrolae* [cf. *R.A.M.*, xv, p. 618] and its alternate host *Pyrola rotundifolia* is described as a case of highly developed physiological balance typical of obligate parasitism in the Uredinales. The diploid mycelium of *C. pyrolae* persists from year to year in the roots of *P. rotundifolia* and invades the buds each year. The leaves developing in the following year are permeated by the mycelium yet do not appear diseased, and the regular functions of the plant are not noticeably disturbed till the third year, when the fungus produces both uredospores and teleutospores and eventually kills the leaves towards the end of the summer. During the second year only very slight anatomical changes occur in the leaves, and a very slight or negligible increase in the intensity of respiration, photosynthesis, and starch formation, but the chlorophyll content was found to be 12·5 per cent. lower and the transpiration 68 per cent. higher than in healthy leaves [cf. ibid., xvii, p. 478]. During the third year (about one month previous to the death of the leaves) respiration was 30 per cent. higher, intensity of photosynthesis 26·6 per cent. lower, and transpiration 2½ times higher than in healthy leaves.

GULYÁS (A.). **A Burgonya virusbetegségei. A virusok jelentösége a leromlásban és az ellenük való védekezések.** [The virus diseases of Potato. Their importance in connexion with degeneration and their control.]—Reprinted from *M. Kir. Gazdas. Akad. Mun.*, i, 3, 63 pp., 33 figs., 1 map, 1938. [German and English summaries.]

Up to the present no adequate work dealing with virus diseases of Hungarian potatoes has been published, and the author points out that a more comprehensive knowledge of the subject would pave the way to efficient control. Among the different types of virus diseases occurring in Hungary the mosaic type is stated to cause the heaviest losses. Leaf roll is widespread and chiefly attacks the Autumn Rose variety. Rugose mosaic, which is stated to be caused by a composite virus [cf. *R.A.M.*, xvii, p. 339], frequently occurs on the Gül Baba variety. The A, X, and Y viruses are also common, while apical leaf roll, chlorotic spotting, calico, and aucuba mosaic occur more rarely. The paracrinkle virus attacking the French Roll variety changes the shape of the tubers. A mosaic disease causing necrotic spots between the veins of the leaves is very often observed on the Rose potato of Lovászpatona. In trials the varieties Görög, Mgc. 36, Kossuth, Mindenes, Nem, Ella, Krüger [President], Mgc. 14, Margit, Öröm, Gondüzö, Wohltmann Gyöngye, and Áldás were fairly resistant to virus diseases. It is recommended that control measures should be applied in breeding and propagating establishments and should be carried out by the State.

BAWDEN (F. C.) & PIRIE (N. W.). **Liquid crystalline preparations of Potato virus 'X'.**—*Brit. J. exp. Path.*, xix, pp. 66–82, 1938.

The authors describe their method of isolation of nucleo-proteins from white Burley tobacco, *Nicotiana glutinosa*, and Kondine Red tomato infected with the S and G strains of potato virus X [*R.A.M.*, xv, p. 390]. Leaves picked from small inoculated plants about a month after infection with strain S, i.e., about three weeks after the symptoms appear, were minced, the sap expressed through muslin, heated with continuous stirring to 60° C., rapidly cooled, and the resulting green, flocculent coagulum thrown down by a few minutes centrifuging at 3,000 r.p.m. The brown, opalescent supernatant fluid was then one-quarter saturated with ammonium sulphate (185 gm. per l.) or brought to P_H 4·5 by the addition of sulphuric acid, producing a brown precipitate containing all the virus. After centrifuging, the precipitate from 1 l. of sap was suspended in 100 c.c. of water, neutralized with dilute caustic soda, centrifuged to remove insoluble materials, and further purified by precipitation and resuspension [by a procedure which is precisely described].

The purified viruses appeared to be solid masses of nucleoprotein, the X-ray measurements of the particles showing a perfect internal regularity of the type found in some large protein molecules. These results indicate that other viruses may also be proteins, as has been suggested in recent studies on *coli* phage by Schlesinger (*Nature*, Lond., cxxxviii, p. 508, 1936) and *Staphylococcus* phage by Northrup (*Science*, N.S., lxxxvi, p. 479, 1937). The 2 per cent. solutions of both strains of the virus were colourless and only faintly opalescent; they remained

liquid crystalline at room temperature until diluted to about 1·5 per cent. Concentrated solutions were spontaneously bi-refringent and dilute solutions showed anisotropy of flow; the nucleoproteins formed bi-refringent jellies when sedimented by high-speed centrifugation and appeared amorphous under the microscope when precipitated with acid or ammonium sulphate. Systemic infection was obtained with 10^{-9} gm. and specific serological reactions with $\frac{1}{6\times10^{6}}$ gm. It was found that purification caused potato virus X to aggregate into rods and reduced its filterability progressively. The virus was inactivated by heat, drying, irradiation, and chemical treatments; only when the protein was denatured was the loss of infectivity followed by loss of serological activity and of optical properties. No significant differences were found in the yields or the physical and chemical properties of the two strains, S and G, and the difference in symptoms caused by them is believed to be the effect of their specific side groups, which they are likely to possess just as they are known to possess specific antigens. A comparison of potato X virus and tobacco mosaic virus showed that they break down differently when heated and that only the former is susceptible to tryptic digestion.

SANFORD (G. B.). **Studies on Rhizoctonia solani Kühn. IV. Effect of soil temperature and moisture on virulence.**—*Canad. J. Res.*, Sect. C, xvi, 5, pp. 203–213, 1 pl., 2 graphs, 1938.

In continuation of his studies on the parasitism of *Rhizoctonia* [*Corticium*] *solani* [*R.A.M.*, xvii, p. 481] on potato sprouts, the author found in pot experiments with artificially infected soil that the optimum temperature for and the rate of growth of *C. solani* varied with different isolates of the fungus. The pathogen seemed equally virulent and the type of injury not essentially different throughout the range of soil water contents from 19 to 40 per cent. at temperatures between 16° and 23° C., but the severity of the disease decreased abruptly at 25°. The rate of growth of the fungus at 16° or 23° was slightly higher in a wet soil than in one of medium water content, but it was somewhat less at 23° in a dry soil than at 16° in a medium or wet soil. In a soil of 20 per cent. water content at 16° the pathogen grew 5 cm. in ten days; in a fertile, steam-sterilized loam of medium water content it grew in ten days as far as it did in four on a nutrient medium. The growth of secondary and tertiary sprouts from severely injured primary sprouts, as a means of recovery, was better in wet than in dry soil at both 16° and 23°, but best in a wet soil at 23°. A high percentage of these secondary sprouts appeared to be highly resistant under conditions in which the primary sprouts were very susceptible and severely attacked by the fungus.

FREDERIKSEN (T.), JØRGENSEN (C. A.), & NIELSEN (O.). **Undersøgelser over Kartoflens Rodfiltsvamp og dens Bekæmpelse.** [Investigations on the Potato stem canker fungus and its control.]—*Tidsskr. Planteavl*, xliii, 1, pp. 1–64, 5 figs., 1938. [English summary.]

This is an exhaustive, fully tabulated account of the symptomatology, life-history, reaction to environmental and cultural conditions,

and control of stem canker of potatoes (*Corticium solani*) [see preceding abstract] under Danish conditions [*R.A.M.*, xiii, p. 720].

The well-known distinguishing features of the disease are recapitulated. The sclerotia on the tubers constitute one of the main sources of infection of the new crop. The normal functions of the roots and young stolons are no doubt impeded by the numerous necrotic lesions developing on these organs, but of much greater importance are the unilateral or girdling cankers on the young stems, the tips of which die before reaching the surface of the soil, while many of the successively produced lateral shoots are also in turn attacked. The growth of severely infected plants, if they survive, is greatly retarded. The foliage of affected plants is chlorotic and the young leaves are often bunched together in rosettes.

A study of monospore cultures of the fungus on potato dextrose agar confirmed the conclusions reached by previous workers as to its life-cycle. The name *C. solani* is preferred to *C. vagum* [ibid., iii, p. 439; ix, p. 739]; the arguments for the identity of the latter with the stem-canker organism are not regarded as convincing.

C. solani has been found to be practically ubiquitous in Denmark, not only on the root system of potato plants but also in the soil, among the heavily infected varieties being King Edward, Preussen, Edeltraut, and Birgitta, while Ackersegen, Gustav Adolf, and Tylstrup Odin are relatively resistant. The type of soil—sand, loam, or humus—and its hydrogen-ion concentration (from P_H 4·7 to 7·6) were found to be of little importance in the development of stem canker, but the disease assumed a more severe form on early (6th to 16th April) than on late (6th to 19th May) planted seed, and to a lesser extent on pre-germinated material. Deep planting (12 cm.) is also conducive to heavy infection, which is minimized by shallow planting. Soil infection may be kept within bounds by a six-year crop rotation, while clean tubers may be obtained by early lifting (about 1st October for Deodara) [cf. ibid., xi, p. 259]. In an extensive series of seed disinfection trials, very good results were secured by five minutes' immersion in a solution of 2 in 1,000 mercuric chloride plus 1 per cent. hydrochloric acid, and by a 30 minutes' dip in 0·5 per cent. uspulun, which may also be used in the dry state mixed with talc in the ratio of 5 : 95. However, notwithstanding the reduction of infection, there was no appreciable gain in the crop yields from the treated seed.

SMALL (T.). **The relation between Potato blight and Tomato blight.**—*Ann. appl. Biol.*, xxv, 2, pp. 271–276, 1 pl., 1938.

Potato and tomato crops grown in close proximity in the open in Jersey suffer from severe attacks of blight (*Phytophthora infestans*) [*R.A.M.*, xv, p. 689], believed by most growers to pass from potatoes, which are attacked first, to tomatoes. In four out of five pot experiments tomatoes inoculated with blight from glasshouse potatoes became infected, but blight from the early outdoor potato crop often failed to infect tomatoes. Early potatoes interplanted with tomatoes in the field were quickly killed by the disease, while the tomatoes remained almost healthy. On the other hand, potatoes infected with conidia taken from the leaves, stems, or fruits of tomatoes, became diseased.

While, therefore, diseased early potato crops are not very dangerous to neighbouring tomato crops, the latter may be a serious menace to the former. Blight lesions did not develop on tomatoes inoculated from outdoor potatoes in the autumn. The results of numerous inoculation experiments supported the view that more than one strain of the fungus exists [cf. ibid., xvi, p. 349; xvii, p. 483, *et passim*] in Jersey.

AKAI (S.). **On the ash figures of leaves of the Rice plant grown under a combination-practice of several effective measures for the control of blast disease.**—*Ann. phytopath. Soc. Japan*, vii, 3–4, pp. 173–192, 3 figs., 1938. [Japanese, with English summary.]

As a result of a comparative analytical study [full data on which are given] of the leaves of rice grown under a combination of practices designed to control *Piricularia oryzae* [*R.A.M.*, xvii, p. 133] and of those of plants cultivated by ordinary methods, the author concludes that the number of silicated epidermal cells per unit area of leaf, especially of the bulliform cells (which are penetrated by the fungus more easily than the long and short cells), was larger in plants grown under such combination practices than in those grown by ordinary methods.

SHIMADA (S.). **Infektionsweise der Blätter der Reispflanzen durch Piricularia oryzae.** [The mode of infection of the leaves of Rice plants by *Piricularia oryzae*.]—*Agric. & Hort.* [*Japan*], xii, pp. 1106–1108, 1 fig., 1937. [Japanese. Abs. in *Jap. J. Bot.*, ix, 2, p. (79), 1938.]

Recent studies in Japan have shown that *Piricularia oryzae* penetrates rice leaves [see preceding abstract] through the cuticle, especially that of the guard and accessory cells. The conidia germinating on the leaf surface form appressoria which send out slender infection hyphae into the cell tissues; these appressoria may be produced, not only on rice leaves but also on those of other plants not susceptible to *P. oryzae* without necessarily causing infection, and even on glass disks. Foliar injury was found to cause an appreciable increase of infection by the blast organism.

RYKER (T. C.) & GOOCH (F. S.). **Rhizoctonia sheath spot of Rice.**—*Phytopathology*, xxviii, 4, pp. 233–246, 5 figs., 1 graph, 1938.

Sheath spot of rice, the causal organism of which is herein described as a new species of *Rhizoctonia*, *R. oryzae* [with a diagnosis in English only], is characterized under Louisiana conditions [*R.A.M.*, xvi, p. 709] by the presence on the lower sheath, and occasionally on the leaves, of straw-coloured, red-bordered lesions, averaging 1 to 3 but sometimes reaching 10 cm. in length and about half as wide, usually situated above the water line and frequently just below the ligule. The disease generally appears during the latter part of July and increases in prevalence until September, affecting all the commercial varieties with equal severity. In 1936 the percentage of infection in different fields ranged from a trace to 50 per cent. *Echinochloa crus-galli* growing in rice plantations is also liable to attack by *R. oryzae*.

Evidence is presented and discussed in support of the writers' belief that the Louisiana fungus is quite distinct from the causal organism

of a similar sheath disease of rice in Japan [ibid., xiii, p. 271], China [ibid., xiii, p. 725], the Philippines [ibid., xi, p. 1], and Ceylon [ibid., xi, p. 599]. *R. oryzae* grows well on plain maize meal, potato dextrose, or bean-pod agar, producing a hyaline to white mycelium consisting of short-celled, extensively branching hyphae which intertwine and anastomose, forming sclerotial masses of varying shades of salmon; the latter do not occur on the host in nature.

Positive results were obtained in inoculation experiments on the Fortuna, Blue Rose, Rexora, Early Prolific, and Colora varieties with *R. oryzae*, *R.* [*Corticium*] *solani*, and *R. zeae* [ibid., xiv, p. 232], all isolated from rice sheath spots, but not with *Trichoderma lignorum* from the same host. More virulent infection followed the direct application of the inoculum to the ligule region than its admixture with the soil, which in certain instances failed to cause symptoms of the disease. Pepper [*Capsicum annuum*], eggplant, tomato, and beans [*Phaseolus vulgaris*] were not attacked by *R. oryzae* or *R. zeae*, but the last-named reacted to inoculation with *Corticium solani* [ibid., xvi, p. 611] by a substantial reduction of germination and the development of lesions. Blue Rose rice seedlings were also injured by a mixture of *C. solani* cultures from 'damped-off' pepper plants.

The optimum temperatures for the growth of *R. oryzae* and *C. solani* were found to be close to 32° and 28° C., respectively, the minimum for both being below 10° and the maximum above 35°. The growth rates of *R. zeae* were essentially similar to those of *R. oryzae*.

BALDACCI (E.). **Il 'brusone' del Riso da cause non parassitarie.** [Non-parasitic 'brusone' of Rice.]—*Ital. agric.*, lxxv, 1, pp. 63–68, 1938.

Renewed attention is being paid to the etiology and control of 'brusone' of rice in Italy [*R.A.M.*, xvii, p. 61 and next abstract] in consequence of the severity of the disease in recent years. Negative results were given by inoculation experiments with two strains of *Piricularia oryzae* isolated from the culm and leaves and with one of a *Helminthosporium*, probably *H. oryzae* [*Ophiobolus miyabeanus*] from the foliage, and the disorder is attributed to adverse physical, chemical, or biological soil factors, possibly correlated primarily with anaerobiosis.

CHIAPELLI (R.). **Mezzi di difesa contro il brusone del Riso.** [Methods of combating 'brusone' of Rice.]—*G. Risicolt.*, xxviii, 4, pp. 63–66, 1938.

The fundamental cause of the 'brusone' disease of rice in Italy [*R.A.M.*, xi, p. 400 and preceding abstract], which commonly assumes the form of a collar rot associated with the mycelium of a sterile fungus, is thought to lie in excessive soil fertility, in particular as regards a superabundance of nitrogen. In new plantations, where the disorder is most prevalent, superphosphate and potassium chloride should be applied at the rates of 8 to 10 and 3 to 4 quint. per hect., respectively. In old fields the continuous use of calcium cyanamide at the rate of 3 to 4 quint. per hect. markedly improves the chemical condition of the soil, while a further amelioration may be effected by a winter application (after ploughing) of lime (3 to 4 quint. quicklime or 8 to 10 of ground calcium carbonate per hect.). Other factors contributing to the

occurrence of 'brusone' are the presence of stagnant water in the fields and sudden falls of temperature. The cultivation of the Bertone variety has had to be practically abandoned on account of its liability to 'brusone', to which the widely grown Maratelli is also gradually succumbing; so far American 1600 and Chinese Original appear to be resistant.

MURRAY (R. K. S.). **Root disease with special reference to replanting.**— *Quart. Circ. Ceylon Rubb. Res. Scheme*, xv, 1, pp. 24–31, 1938.

In an address given to the Sabaragamuwa Planters' Association in January, 1938, the author describes the mode of life and parasitism of *Fomes lignosus*, *F. noxius*, and *Poria hypobrunnea* [*R.A.M.*, xvii, p. 202] causing root disease of *Hevea* rubber in replanted clearings. There is reason to believe that the rhizomorphs of the fungi are likely to spread along the roots only during the first few months after felling while the roots are still fairly fresh. In most of the replanted clearings known to the author the number of diseased trees amounted to considerably less than 1 per cent. of the total stand. As a measure of control the author recommends the removal of all old roots immediately after felling in clearings where the presence of root disease is definitely known, but this measure is considered uneconomic where the disease is not suspected. The use of leguminous plants as indicators is not advised, as interfering with the usual agricultural practices and not offering sufficient evidence as to the presence of the fungi in question, their death being also caused by other organisms. On the other hand it is suggested that the young rubber plants themselves can serve as indicators, and as soon as they show symptoms the source of infection should be traced and eliminated.

NIETHAMMER (ANNELIESE). **Wachstumsversuche mit mikroskopischen Bodenpilzen.** [Growth experiments with microscopic soil fungi.]— *Arch. Mikrobiol.*, ix, 1, pp. 23–30, 1938.

Full details are given of the writer's experiments at Prague, Czechoslovakia, to determine the effect of the addition of various metallic compounds to a synthetic cane sugar culture medium on the growth at 20° C. of a number of widely distributed soil fungi [*R.A.M.*, xvii, pp. 64, 484].

The production of conidia by *Trichoderma koningi* was inhibited by nickel sulphate at concentrations of 0·0001 to 0·05 per cent.; in the case of zinc and iron sulphates conidia were produced in the presence of these compounds at strengths of up to 1·0005 per cent. Sodium fluoride exerted an injurious action on the mycelium at 0·0001 to 0·005 per cent. and completely suppressed development at higher concentrations. Conidial germination was inhibited by germisan at 0·0001 to 0·005 per cent. No conidia were produced in the synthetic solution without the addition of metals.

Acaulium nigrum formed perithecia under the influence of iron and zinc sulphates at 0·0001 to 0·005 per cent., while the production of conidia was induced by 0·0001 to 0·005 per cent. nickel sulphate. In the control series chlamydospore formation was abundant but no reproductive organs developed.

The joint admixture with the culture solution of iron and zinc sulphates (0·0001 to 0·05 per cent.) stimulated the production of the characteristic purple pigmentation by *Fusarium oxysporum*.

The formation of conidia in *T. koningi* was further induced by filtrates from 10-day-old cultures of *Penicillium luteum* and *P. expansum* in cane sugar solution (0·1 per cent.), and by an extract of dried beet leaves (2 c.c. per 18 c.c. solution), whereas a similar extract of *Ranunculus bulbosus* 'bulbs' inhibited the process.

In experiments to ascertain the reciprocal influence of seedlings and fungi grown together in Erlenmeyer flasks on 1 per cent. agar at 19° to 26° the roots of wheat secreted a substance toxic to *P. expansum*, the development of which was further retarded by seed treatment with abavit dust. Both *Dematium* [*Pullularia*] *pullulans* and *T. koningi* made profuse growth on the wheat seedlings, the former producing an abundance of small, circular, dark grey sclerotia on the roots. Seed treatment with abavit failed to arrest the development of these organisms. *F. oxysporum* also vigorously attacked the wheat seedlings but was controlled by abavit. When *Penicillium expansum* and *Cladosporium herbarum* are simultaneously inoculated into wheat seed-grain, the latter gains the upper hand and rapidly suppresses the former. In the case of *C. herbarum* and *T. koningi* the latter is the more active.

P. expansum severely infected cabbage seedlings and was only partially controlled by abavit. In the case of tomato the attacks of the fungus were repelled by healthy seedlings, but those arising from defective seed showed no resistance.

GARRETT (S. D.). **Soil conditions and the root-infecting fungi.**—*Biol. Rev.*, xiii, 2, pp. 159–185, 1938.

Following an introductory note on the relation of fungous diseases of plants to the soil environment, the writer summarizes and critically discusses a number of important recent contributions to this subject under the main headings of 'ecology of the root-infecting fungi' and 'component factors of the soil environment in relation to some soil-borne fungus diseases'. Nearly all the work referred to has been noticed from time to time in this *Review*.

NARASIMHAN (M. J.). **A new sprayer for Arecanut spraying.**—*Mysore agric. Cal. 1938*, p. 7, 1 pl., 1938.

A new apparatus, 'Primus', of the Headland type, for spraying areca palms [*Areca catechu* against *Phytophthora arecae*: *R.A.M.*, xv, p. 77] was recently demonstrated in Mysore. Whereas with the sprayer hitherto used the operator, with the apparatus strapped to his back, has to climb the palm before he can spray the branches, with this Primus sprayer the climber takes with him only a long hose with the result that nearly 1,500 trees can be sprayed per day, as against only 300 trees with two of the old-type sprayers. The cost of the sprayer is about Rs 70, as against about Rs 26 for the old-type, one-gallon sprayer. Attempts are being made to introduce the new sprayers into villages where spraying is carried out on a co-operative basis.

Annual Report on the Department of Agriculture, Zanzibar Protectorate, 1937.—30 pp., 1938.

Monthly observations made on a block of 800 clove trees in Zanzibar since September, 1934, showed that the mortality from the condition known as 'sudden death' [*R.A.M.*, xvi, p. 301] was 83 up to December, 1935, 136 during 1936, and 79 in 1937.

HAMPP (H.). **Prüfung der Peronospora-Bekämpfungsmittel auf dem Hopfenversuchsgut Hüll 1937.** [Trial of Hop *Peronospora* control preparations in the Hüll Hop Experimental Garden in 1937.]—*NachrBl. dtsch. PflSchDienst*, xviii, 4, pp. 30–31, 1938.

The meteorological conditions prevailing in south Germany in 1937 favoured the development of hop downy mildew (*Peronospora*) [*Pseudoperonospora humuli*], trials in the control of which with various new preparations [*R.A.M.*, xvi, p. 773] were continued during that year on the very susceptible Hallertau variety. The only one approaching Wacker's Kupferkalk [included for comparative purposes] in toxicity to the fungus was 'A' ('copper economy mixture'); used at the prescribed strength of 1 per cent., however, it caused scorching, particularly of the umbels, besides being troublesome to prepare. Moderately good results were also obtained with Borchers' Kupferkalk, but the use of three non-copper-containing mixtures tested cannot be recommended. Ob 72 [ibid., xvi, p. 617] showed considerable promise but was used in too few tests for a conclusive judgment as to its merits to be formed.

VARADARAJA IYENGAR (A. V.). **Lime in relation to spike disease of Sandal.**—*Chron. bot.*, iv, 3, pp. 205–206, 1938.

Further investigations into spike disease of sandal [*Santalum album*] in India [*R.A.M.*, xvi, p. 837] demonstrated that the earliest reaction to infection is a disturbed calcium-nitrogen metabolism. The translocation of lime from the roots to the growing points is checked, with the result that the roots of affected plants are rich, and the leaves and twigs poor, in calcium. Nitrogen, on the other hand, rapidly reaches the aerial parts from the roots, causing proliferation of the vegetative organs at the expense of the reproductive. The reduced size of affected leaves is probably due to lime deficiency.

In the affected areas the soil beneath the diseased plants contained twice as much lime as that beneath the healthy plants. Examination during the incubation period of plants predisposed to the disease showed 5 per cent. lime in the dry weight of the leaves with only 1·5 to 2 per cent. nitrogen; such plants always gave an abnormal production of flowers. When plots containing healthy and diseased plants were limed more spike developed than in similar untreated plots.

From these observations it is concluded that the immediate cause of spike is poor intake of calcium by the roots, and growth due to some toxin secreted after infection has become established. The importance of this view is that it serves to connect together the virus and physiological theories of the nature of the disease.

The Australian Sugar Producers' Association Ltd. Annual Meeting and Conference.—*Aust. Sug. J.*, xxx, 1, pp. 7–13, 15–21, 23–29, 31–37, 39–48, 53–55, 57–61, 63–67, 69–73, 75–79, 81–82, 1938.

A. F. Bell, addressing the annual meeting of the Australian Sugar Producers' Association at Brisbane on 21st March, 1938, emphasized the necessity of detailed surveys for the early detection of downy mildew [*Sclerospora sacchari*: *R.A.M.*, xvii, p. 66] and Fiji disease of sugar-cane [ibid., xvii, p. 486 and next abstract]. At least every fourth row of a field should be traversed (every second row in the case of tall cane): the employment of special inspectors for this purpose would necessitate an annual outlay by the Bureau of Sugar Experiment Stations of £20,000, but in the meantime the presence of abnormal stools must be notified by the 8,000 farmers who continually cover their plantations in the normal routine of cultivation. Notwithstanding the publicity given to the recent outbreaks of Fiji disease among the valuable P.O.J. 2878 variety in the Bundaberg area, infection was observed on four further farms during the last survey. Steps are being taken to prohibit the growing of this variety in parts of the Mackay area owing to its susceptibility to downy mildew, and a similar course will have to be followed in Bundaberg unless prompt measures are adopted for the eradication of Fiji disease.

Fiji disease and P.O.J. 2878 in the Maryborough district.—*Aust. Sug. J.*, xxx, 1, p. 5, 1938.

The Bureau of Sugar Experiment Stations has recently been requested to gazette P.O.J. 2878 as an approved variety of sugar-cane for the Bidwell-Magnolia section of the Maryborough district of Queensland, but the application cannot be entertained by reason of the extreme susceptibility of the variety in question to Fiji disease [see preceding abstract]. The disease was first observed in the district in 1926 and reached a climax in 1935; during the past three years the situation has improved but is still far from satisfactory, a number of fields with 10 per cent. or more infection having been observed in the 1937 survey. Much greater use should be made of the resistant Co 290, P.O.J. 213, and P.O.J. 234 varieties. Ultimately the widely grown susceptible 1900 seedling will also have to be disapproved, but hardship would be inflicted by its abolition at the present stage.

Hopkins (J. C. F.). **A Preliminary list of Rhodesian fungi.**—*Trans. Rhod. sci. Ass.*, xxv, 2, pp. 97–127, 1938.

In this annotated list of 430 Rhodesian fungi (incorporating material collected by the late F. Eyles [cf. *R.A.M.*, v, p. 716]) bibliographical references to the original descriptions of each species are given. Five new species are listed and are furnished with Latin diagnoses, apart from *Phoma caricina* on papaw, which is fully described in a later paper [see above, p. 611].

Miller (J. H.). **Studies in the development of two Myriangium species and the systematic position of the order Myriangiales.**—*Mycologia*, xxx, 2, pp. 158–181, 4 pl., 1938.

A detailed and fully illustrated account is given of the author's

studies in serial sections of the development of the various organs of *Myriangium duriaei* [*R.A.M.*, xv, p. 216], which is widely distributed throughout the world as a parasite on scale insects on many kinds of trees, and of *M. curtisii* Mont. & Berk., which, judging from the literature, is confined to the southern United States as a parasite of scale insects on various trees. The investigation was undertaken with a view to throwing some light on the correct position for *Myriangium* and related forms in the Ascomycete system, which has been variously interpreted by different authors. In his opinion, the families of the Myriangiales show progressive development in stroma and definition of the fruiting body beginning with the Elsinoeae, through the Plectodiscelleae, the Myxomyriangiaceae, and finally the Myriangiaceae. In a natural system they should be placed next to the Plectascales; the present tendency to align them with the Pyrenomycetes is untenable, as none of them produces perithecia or has the internal arrangement of members of that family.

Lepik (E.). **Beiträge zur Nomenklatur der Ostbaltischen Pilzflora III.** [Contributions to the nomenclature of the East Baltic fungus flora III.]—*Mitt. phytopath. VersSta. Univ. Tartu* 47, pp. 226–242, 2 pl., 1938.

This is a critically annotated list with revised nomenclature of Dietrich's second 'century' of East Baltic cryptogamic fungi, published at Reval in 1853, of which three copies, in a fair state of preservation, are stated to be available in Estonia.

Rick (J.). **Monografia das Poliporineas riograndenses.** [Monograph of the Polyporineae of the Rio Grande.]—*Broteria*, vii, 1, pp. 5–21, 1938.

Latin and Portuguese descriptions are given of 38 Polyporineae, including two new species, from the Rio Grande, Brazil [cf. *R.A.M.*, xvii, p. 348].

Yen (W. Y.). **Germination des spores de quelques Ustilaginées.** [Germination of the spores of some Ustilagineae.]—*Bull. Soc. mycol. Fr.*, liii, 3–4, pp. 339–345, 4 figs., 1938.

Notes are given on the spore germination of the following smuts, viz., *Ustilago olivacea* found on *Carex riparia* in France, *U. olivacea* var. *macrospora* n. var. found on *C. cladostachya* in Costa Rica, *U. scolymi* on *Scolymus hispanicus* in Spain, and *Sphacelotheca* [*U.*] *panici-miliacei* [*R.A.M.*, xvi, p. 26] found on *Panicum miliaceum* in Rumania.

In Czapek's liquid medium the spores of *U. scolymi* give rise to a generally 4-celled promycelium 30 to 37·2 by 3·6 to 6 μ, with oblong, elongated sporidia 9·6 to 18 by 2·4 to 3·6 μ, which multiply rapidly by budding on the surface of the medium. One spore may give rise simultaneously to two promycelia in the same or opposite directions, which later produce true sporidia. Sometimes the sporidia may form before the promycelium becomes septate. Very occasionally, several sporidia are formed simultaneously at the level of a septum, while the remaining cells of the promycelium are still sterile.

Material of *U. panici-miliacei* kept in the herbarium for five years

showed a very small percentage germination of the spores on carrot juice and liquid beer wort media. It was found that the four promycelial cells generally give rise to true sporidia which either bud or emit thin, branched hyphae; the germinative characters are identical with those of *U. hordei*.

MATSUMOTO (T.). **An unusual mode of transmission of a certain Tobacco virus disease somewhat closely related to leaf curl or kroepoek.**—*Trans. nat. hist. Soc. Formosa*, xxviii, 176, pp. 123–137, 2 pl., 1938.

The author announces the discovery of a new dwarf disease of Virginian tobacco on young plants in pots and seed-beds. The disease, which is stated to be very serious, especially in seedlings, is caused by a virus and closely resembles leaf curl or 'kroepoek' [*R.A.M.*, xvii, p. 416], except for the absence of enations. The diseased plants are much dwarfed and the leaves, which are also reduced in size, are rolled downwards along the margin, more or less thickened, and very brittle. The upper surface of mature leaves is dark green, more or less ribbed, and slightly wrinkled, the lower surface yellowish-green and very glossy. The upper immature leaves are chlorotic, the secondary veins somewhat thickened, and the flower buds, if produced, are underdeveloped and more or less bleached. In 21 experiments on the transmission of the disease the author found that tobacco planted in soil in which diseased plants had previously been grown did not contract infection, that a limited amount of infection resulted from rubbing healthy leaves with diseased ones, and that the disease was easily transmitted when leaves of healthy and diseased plants were kept either in direct contact or at a distance of not more than 5 to 10 cm. apart, even when screens of wire gauze or glass plates were interposed. The author suspects that some form of air transmission is involved [but in a supplementary note on p. 256 of the *Journal* states that mites were found on the plants and their occurrence must be taken into consideration].

CLAYTON (E. E.), SMITH (H. H.), & FOSTER (H. H.). **Mosaic resistance in Nicotiana tabacum L.**—*Phytopathology*, xxviii, 4, pp. 286–288, 1 fig., 1938.

Attention is drawn to the existence of certain genetic factors modifying the expression of the two genes conferring resistance to tobacco mosaic [*R.A.M.*, xvii, p. 417], and apparently apt to give rise to erratic behaviour in back-crossing experiments, as in 1937, when 23 F_2 populations derived from the second back-cross of resistant selections to susceptible parent varieties yielded only two-thirds of the expected number of resistant plants. Three indications of the existence of such modifying factors are available, namely, (1) the decreasing proportion of typical resistant plants in the F_2 after the second back-cross to the susceptible parent, due to the accumulation of genes reducing resistance from class 1 (none or very faint markings) to 2 (distinct diffuse spotting) or 3 (mild systemic mottling); (2) the tendency of resistant F_2 Ambalema selections crossed with susceptible varieties to segregate for classes 1, 2, and 3 in the F_3; and (3) the varying degrees of resistance found in the collections from Colombia all of which possessed the two major

recessive genes for resistance. It is obvious that the existence of genes modifying the normal expression of mosaic resistance presents a serious problem in the development of a breeding programme entailing frequent back-crosses to the susceptible parent.

MILLER (P. R.). **Serum diagnosis of virus diseases of Tobacco.**—*Plant Dis. Reptr*, xxii, 5, pp. 74–77, 1938. [Mimeographed.]

Further tests carried out in 1937 with K. S. Chester's serological method of identifying tobacco virus diseases [*R.A.M.*, xvi, p. 767] showed that it readily enabled mosaic diseases to be detected, but with other virus diseases the amount of tobacco juice required was so large that it prevented a clear vision of the reaction. In yet other experiments on 64 different tobacco mosaic selections [see next abstract] it was noted that there appeared to be some relation between the type of reaction obtained and the depth of the precipitate. Only one selection, 12316, completely failed to react to the mosaic serum, but selections 12304, 12311, and 12360 reacted so faintly that the reactions should probably be regarded as negative. With other sera, e.g., ring spot, veinbanding, etch, aucuba mosaic, and latent mosaic, the reaction was obscured by the excessive amount of plant material present in the tested juice. It is concluded that this method of diagnosis is highly satisfactory for mosaics, but needs to be modified in some way so that the juice can be cleared of extraneous matter before it can be adapted for field use with other virus diseases.

VALLEAU (W. D.) & DIACHUN (S.). **Tests of strains of Tobacco mosaic virus with Chester's field test.**—*Plant Dis. Reptr*, xxii, 5, pp. 77–81, 1938. [Mimeographed.]

Field tests on 64 strains of tobacco mosaic with K. S. Chester's serological method of identification [see preceding abstract] were carried out in Kentucky, using the fourth leaf in the growing point, generally a well-developed one from which the required amount of juice could easily be squeezed. The results obtained [which are tabulated] showed that certain strains which were not inactivated by drying, and appeared to be typical tobacco mosaics in the field and greenhouse, failed to react. The test gave positive results with most of the strains, but cannot be considered as accurate a method for identifying the viruses at present classed as common or ordinary field mosaic as is the drying test in which leaves dried for 30 days are powdered, mixed with water, and used as inoculum on test plants.

MARTIN (L. F.), BALLS (A. K.), & MCKINNEY (H. H.). **The protein content of mosaic Tobacco.**—*Science*, N.S., lxxxvii, 2258, pp. 329–330, 1938.

A method has been developed of distinguishing between trypsin-resistant tobacco mosaic virus protein [*R.A.M.*, xvii, p. 273] and normal proteins without resorting to extraction of the tissue. The procedure involves the determination of total nitrogen and nitrogen soluble in 10 per cent. trichloracetic acid, the latter before and after digestion with commercial trypsin.

Results were obtained by this method in co-operative experiments

by the Food Research Division, Bureau of Chemistry and Soils and the Division of Cereal Crops and Diseases, Bureau of Plant Industry, United States Department of Agriculture, on three tobacco varieties (Wisconsin-Havana, Ambalema, and 448A) and three strains of tobacco mosaic (common, mild, and yellow). Wisconsin-Havana reacted to inoculation with common mosaic by a severe pale green mottling, to yellow mosaic by pronounced yellow mottling, and to mild mosaic by mild light green mottling. No symptoms were induced in Ambalema or 448A by common mosaic. The total nitrogen and protein contents of the infected plants underwent very little change in comparison with the normal, irrespective of the severity of the disease. In the case of common mosaic the trypsin-resistant protein, believed to represent virus protein, exists in a smaller proportion than hitherto supposed, though the amount was higher in Wisconsin-Havana (up to 1·10 mg. per gm.) than in the other less susceptible varieties. There is at present no evidence that the yellow mosaic virus is resistant to trypsin.

VAN DER POEL (J.). **Overzicht van de thans verkregen resultaten bij het onderzoek naar den invloed van verschillende meststoffen op de slijmziekte.** [Survey of the results hitherto obtained in the investigation on the influence of various fertilizers on slime disease.] —*Meded. Deli-Proefst.*, Ser. 2, xcix, 31 pp., 1938. [English summary.]

In further experiments to determine the influence of fertilizers on slime disease (*Bacterium solanacearum*), tomatoes (which are stated to be even more susceptible than tobacco in Sumatra [*R.A.M.*, xvii, p. 416]) were grown in zinc trays in infected alluvial sandy loam soil with the addition of various nutrient substances.

Low-grade superphosphate (1,000 mg. [? P_2O_5] per tray of 1,200 gm. soil containing 25 seedlings) gave the best results in the phosphate series of tests, reducing the incidence of infection from 38±4·5 and 75±6·0 to 2±0·8 and 13±2·8 per cent., respectively, in two experiments. High-grade superphosphate and basic slag were less uniformly effective, while dicalcium phosphate and ground rock phosphate produced no appreciable improvement. The incidence of infection was also greatly reduced by mixtures of low-grade superphosphate and ammonium sulphate, gypsum (believed to be the active component of low-grade superphosphate in respect of slime disease control), high-grade superphosphate and ammonium sulphate, acetate of lime and ammonium sulphate, high-grade superphosphate and potassium sulphate, and calcium chloride and potassium sulphate. Potassium sulphate alone or with magnesia is effective against slime disease only when applied in heavy doses (1,000 mg. K_2O per tray). Groundnut meal (2 gm. per tray) reduced the amount of slime infection by 50 per cent.

In a field trial seven plots without groundnut meal received per hect. 300 kg. urea, 360 kg. 36 per cent. high-grade superphosphate, and 1,080 kg. tobacco stalk ash, while seven with groundnut meal were given 2,100 kg. groundnut meal, 720 kg. high-grade superphosphate, and 1,080 kg. tobacco stalk ash. In 1932 the percentages of diseased plants on the two series of plots were 69·4 and 68·9, respectively; in

1936 the numbers of dead plants after 60 days in the urea and meal plots were 32·4 and 15·9 per cent., respectively.

The results of experiments with different forms of nitrogen showed nitrates to be more effective than ammoniacal compounds in the control of slime disease, which is also favourably influenced by the use of ground *Mimosa invisa* stems as manure. The admixture of ground *Macaranga denticulata* leaves caused a 12 per cent. reduction of *Bact. solanacearum*, which was increased to 43 per cent. by the addition of nitrogen, the corresponding figures for ground *Imperata cilindrica* foliage with and without nitrogen being 16 and 46 per cent., respectively. Sugar, starch, or cellulose, combined with guano (200 mg. nitrogen, 400 mg. phosphoric acid, and 250 mg. potash per tray), noticeably reduced the incidence of slime disease, while a beneficial action was also exerted by starch and ammonium sulphate. Presumably the use of organic compounds as fertilizers encourages organisms in the soil microflora antagonistic to *Bact. solanacearum*, which is suppressed [cf. ibid., xv, p. 395].

Van der Weij (H. G.). **Overzicht van de ziekten en plagen der Deli-Tabak in het jaar 1937. A. Ziekten der Tabak.** [Report on the diseases and pests of Deli Tobacco in the year 1937. A. Tobacco diseases.]—*Meded. Deli-Proefst.*, Ser. 2, 98, pp. 3–9, 1938.

During 1937 it was necessary to break up 57,604 tobacco seed-beds in the Deli district of Sumatra on account of slime disease (*Bacterium solanacearum*) [*R.A.M.*, xvi, p. 413; xvii, p. 490 and preceding abstract], the corresponding number for the previous year being 55,406. The average incidence of infection in the field was 10·7 per cent. (10·3 in 1936). The disease assumed a serious form in mature plants, producing the so-called 'long kong' or hollow stem effect.

Phytophthora [*parasitica*] *nicotianae* necessitated the clearance of 1,310 seed beds as compared with 295 in 1936. The loss of leaves in the field was estimated at 1,500,000. *Cercospora nicotianae* was again responsible for heavy damage on most of the 47 estates under observation.

Mosaic also caused extensive injury in 22 plantations. Rotterdam B disease [ibid., xvi, p. 129] and 'gilah' [identical in part with leaf curl: see above, p. 629] were also prevalent, the former being present on 28 and the latter on 35 estates. 'Daon lidah' [*R.A.M.*, xvii, p. 416] or 'pointed leaf' appears to be a composite name for a group of obscure pseudo-mosaic disorders and is reported from 12 plantations.

Notes are also given on some non-parasitic and climatological disturbances and on certain troubles occurring during the processes of curing and fermentation.

Fourmont (R.). **Un Ascochyta parasite du Tabac.** [An *Ascochyta* parasitic on Tobacco.]—*Rev. Path. vég.*, xxv, 2, pp. 119–134, 5 figs., 1938.

From tobacco growing near Bordeaux and showing irregular, oval lesions on the stem, over which the bark was raised, cracked, and silver white, the author isolated a species of *Ascochyta* and a *Coniothyrium*; the latter was found to be saprophytic.

Glasshouse inoculations with the former fungus on previously wounded leaves of *Nicotiana rustica* gave lesions 2 cm. in diameter in three weeks; the affected tissues turned black, dried up, and became perforated, leaving a brown edge. Needle-prick inoculations of unwounded leaves of five-months-old Paraguayan tobacco (*N. tabacum* var. Paraguay) three weeks later gave lesions 1 cm. in diameter, membranous, often perforated in the centre, and bordered by a discoloured zone, this being the usual appearance of the spots after infection of unwounded leaves. *N. glutinosa* was more rapidly and extensively attacked. On unwounded stems of *N. petiolaris* elongated, superficial spots appeared, while on wounded stems the tissues were destroyed as far as the centre, and the edges of the necrosed parts became covered with pycnidia. Inoculations of the unwounded leaves of potato, tomato, and beetroot also gave positive results.

Field inoculations made at the end of July by placing a fragment of culture on unwounded leaves of Paraguayan tobacco and *N. glauca* caused necrosis of the tissues, which turned brown and became surrounded by a discoloured margin; on wounded leaves the necrosis was followed by perforation. On unwounded stems of Paraguayan tobacco, Hungarian tobacco (*N. tabacum* var. Hongrie) and *N. alata* irregular, oval spots appeared, generally at intervals of 5 or 6 cm. along the length of the stem; occasionally one long, narrow, superficial lesion was formed. When the fungus was inserted in cuts made in the stems of Paraguayan tobacco it destroyed the cut surfaces, enlarging the wound, and spreading to the medulla. On *N. glauca* the stems turned black round the wounds, and the edge of the affected areas became violet. Crevices developed, and the wounds became confluent, though some cork formation took place later.

Experimental evidence showed that the fungus grew best at about 22° C., was not killed by exposure to 0°, and that the thermal death point lay between 35° and 41°.

The fungus, which is named *A. ducometii* n. sp. [with a Latin diagnosis], is characterized by round, rather flat, brown, ostiolate pycnidia measuring 100 to 230 by 75 to 220 (average 140 by 125) μ, and oblong-ovoid or subcylindrical, continuous, later uniseptate, not constricted, hyaline spores, 5·2 to 8·2 by 2·8 to 3·8 (average 3 by 7) μ.

Ainsworth (G. C.), Oyler (Enid), & Read (W. H.). **Observations on the spotting of Tomato fruits by Botrytis cinerea Pers.**—*Ann. appl. Biol.*, xxv, 2, pp. 308–321, 2 pl., 2 figs., 1938.

The symptoms of spotting of field and glasshouse tomatoes caused, as recently demonstrated [*R.A.M.*, xvi, p. 728], by *Botrytis cinerea*, consist of minute, brownish punctures in the centre of pale green or silver-coloured spots, 0·2 to more than 0·5 cm. in diameter, which increase in size as the fruit swells and occur more frequently at the calyx end of the fruit, although occasional severe spotting of the blossom end has been observed. There is often a slight swelling round the centre of the spot. Several series of experiments showed that spotting was favoured by high humidity; that resistance to *B. cinerea* increased with the growth of the fruit (correlated with increase in thickness of the epidermal cell wall); and that fruit on the plant was more easily

spotted than similar detached fruit, which is tentatively explained by the greater turgidity of the fruit on the plant. The experimental data suggest that the air-borne spores of *B. cinerea* germinate on the surface of immature tomato fruits under temporary conditions of high humidity, penetrate the epidermis, and form the spots by the action of pectinase secreted by the germ tubes, but that the sporelings die with the return of drier conditions so that no fungus can subsequently be isolated from mature spots. Similar spots were experimentally produced by other species of *Botrytis*, but not by other fungi capable of attacking tomatoes. The *Botrytis* spot is compared with the injury caused by *Myzus convolvuli* [*Macrosiphum solani*], for which the name stigmonose, applied by Bewley in 1923 to Aphid damage of tomato, is retained [ibid., xvi, p. 421], and the differences in symptoms are pointed out. It is suggested that the use of the best horticultural practice will effectively remove the two main sources of *Botrytis* spotting: excessive humidity and the presence of *Botrytis* spores harboured by infected plant debris. Fumigation is recommended against stigmonose.

[An abridged account of these studies by the two first-named authors was published in *Gdnrs' Chron.*, cii, pp. 380–381, 2 figs., 1937.]

Bond (T. E. T.). **Infection experiments with Cladosporium fulvum Cooke and related species.**—*Ann. appl. Biol.*, xxv, 2, pp. 277–307, 2 pl., 16 figs., 1938.

The author describes the symptoms and the histology of infection by *Cladosporium fulvum* causing leaf mould on tomato [*R.A.M.*, xvii, pp. 140, 419]. The hyphae of the fungus are shown to penetrate the host through the stomata without forming any appressoria or other modifications, the frequency of penetration being far greater at a humidity fluctuating from saturation point to 85 per cent. than at constant saturation. It is suggested that the penetration is at least partly controlled by a hydrotropic stimulus. The mycelium is intercellular and without haustoria, developing normally only as long as the host cells are alive, and its initial rate of spread within the host is slower in the basal region of the plant than in the middle, and in the variety Maincrop than in Giant Red. Normal stomatal penetration was observed in a wide range of immune and 'inappropriate' hosts, but symptoms of infection occurred only in the varieties of *Lycopersicum esculentum*, in *L. humboldtii*, and in two strains received as *L. racemigerum*, which are apparently more closely related to the cultivated than to the true currant tomato (*L. pimpinellifolium*: syn. *L. racemigerum*). In the last-named the mycelium is also shown to be intercellular and without haustoria; it produced no conidiophores and appeared to remain alive in the leaf for a considerable period, becoming more restricted in its spread with the advancing age and relative maturity of the leaf. No external symptoms of infection were observed and only isolated cells in immediate contact with the hyphae became necrotic. Essentially similar observations were recorded for species of *Solanum*, *Hyoscyamus*, *Nicotiana*, and *Schizanthus*, while on other Solanaceae and in plants belonging to the Scrophulariaceae, Compositae, and Cucurbitaceae an extensive growth of mycelium was observed. The study of *C. cucumerinum*, which is pathogenic to the fruits and foliage of cucumber and to

the young shoots of *Bryonia dioica*, and *C. herbarum*, which is not considered to be a potential parasite of the plants inoculated, revealed a behaviour apparently identical with that of *C. fulvum* in the following respects: stomatal penetration by unaltered germ-tubes, intercellular mycelium without haustoria, typical for infection of foliage; and the formation of conidiophores of subepidermal origin. It is suggested that these features may prove characteristic of the genus *Cladosporium* as a whole.

BAXTER (D. V.). **Some resupinate Polypores from the region of the Great Lakes. IX.**—*Pap. Mich. Acad. Sci.*, xxiii, pp. 285–305, 9 pl., 1938.

In this paper [cf. *R.A.M.*, xvi, p. 788] the author states that the programme of research dealing with the resupinate Polypores of North America comprises the transfer of between 1,200 and 1,500 cultures annually, and the addition of new isolations from different substrata, new species, and previously recorded hosts which have been obtained from other regions, to the existing collections. Descriptions of twelve species of *Poria* are given, among them four new ones and several forms rare to North America. The characteristics of ten resupinate Polypores in culture are discussed and tabulated.

HIRT (R. R.). **A progress report on laboratory tests of the relative durability of different varieties of Black Locust to certain wood decay fungi.**—*J. For.*, xxxvi, 1, pp. 52–55, 1938.

In comparative tests under controlled conditions at the New York State College of Forestry on the relative resistance of blocks of the common black locust (*Robinia pseud-acacia*) and the shipmast locust (*R. pseud-acacia* var. *rectissima*) from Long Island to pure cultures on nutrient agar of *Polyporus robiniophilus* (Murr.) Lloyd, *Fomes rimosus* [*R.A.M.*, xiv, p. 62], *F. igniarius* [ibid., xvii, pp. 12, 358], and *Poria incrassata* [ibid., xiv, p. 276], the mycelia of the fungi grew with equal profusion over both species of locust, except in the case of *Polyporus robiniophilus* which was definitely more scanty on the shipmast variety than on *R. pseud-acacia*. After five months the latter was discoloured and decayed by all the fungi, the wood attacked by *Poria incrassata* being deep brown, cracked, and very brittle, while the other organisms induced a bleached effect. *R. pseud-acacia* var. *rectissima* was slightly rotted only by *P. incrassata* (2·31 per cent. loss of weight compared with 33·32 per cent. (averages) for black locust infected by the same fungus). The weight losses in *R. pseud-acacia* caused by *Polyporus robiniophilus*, *F. igniarius*, and *F. rimosus* were 3·99, 2·24, and 8·63 per cent., respectively.

COLLINS (D. L.). **Feeding habits of Scolytus multistriatus Marsham with reference to the Dutch Elm disease.**—*J. econ. Ent.*, xxxi, 2, pp. 196–200, 2 diags., 1938.

Extreme variation was observed in the range and extent of feeding by the bark beetle, *Scolytus multistriatus*, in the crotches of elm twigs in New York State. Observations made on over 500 trees, involving the examination of more than 100,000 crotches, indicate that the presence of wood which is either attracting or producing beetles in or

near a given tree renders that individual more liable to feeding attacks. The exact value of spraying as a control measure against *S. multistriatus* remains doubtful, but it is becoming increasingly clear that the removal of injured, dying, and dead elm wood should not only assist in the extermination of the beetles by destroying their breeding places, but also help to reduce the spread of Dutch elm disease [*Ceratostomella ulmi*: *R.A.M.*, xvii, p. 568] by minimizing the attraction of healthy trees for possibly contaminated insects.

GOIDÀNICH (G.). **Notizie sulle ricerche di selezione di Olmi resistenti alla grafiosi.** [Notes on researches in the selection of Elms resistant to graphiosis.]—*Ital. agric.*, lxxv, 1, pp. 69–74, 4 figs., 1938.

In recent inoculation experiments in Italy to determine the reaction of certain elm selections to graphiosis [*Ceratostomella ulmi*: *R.A.M.*, xvi, pp. 353, 844], *Ulmus campestris*, though susceptible in general, was found to include a number of resistant individuals characterized by various structural peculiarities; the behaviour of *U. montana* was variable; *U. laevis* and *U. pumila* [see next abstract] were resistant; *U. americana* proved to be highly susceptible; and a high degree of resistance was shown by the 'C. Buisman' elm grafted on *U. hollandica* or *U. pumila*. In small-scale tests with exotic varieties of minor importance *U. laciniata nikkoensis* was resistant.

WOLLENWEBER (H. W.) & RÖDER (K.). **Das Verhalten einer Pfropfulme (Ulmus pumila) gegen Graphium ulmi.** [The reaction of a grafted Elm (*Ulmus pumila*) towards *Graphium ulmi*.]—*NachrBl. dtsch. PflSchDienst*, xviii, 4, pp. 31–32, 1 fig., 1938.

Somewhat disappointing results, both as regards growth habit and reaction to *Ceratostomella ulmi*, were obtained in further experiments at the Biological Institute, Berlin-Dahlem, in the grafting of scions of the reputedly resistant *Ulmus pumila* on stocks of the susceptible native species commonly used for street planting [*R.A.M.*, xvi, p. 844]. Inoculation experiments with the fungus on the grafted crown resulted in the development of the typical elm disease symptoms, including cigar-shaped rolling of the leaves and distortion of the branch tips, followed by complete defoliation after ten weeks. *C. ulmi* was isolated from the discoloured vascular tissues of an infected branch. Similar objections would in all probability apply to another Asiatic species, *U. pinnato-ramosa*, but tests are planned to determine the value for grafting purposes of the Spanish selection, *U. foliacea* No. 24 (Christine Buisman elm), promising results with which are reported from Holland [and see preceding abstract].

PETRAK (F.). **Beiträge zur Kenntnis der Gattung Hercospora mit besonderer Berücksichtigung ihrer Typusart Hercospora tiliae (Pers.) Fr.** [Contributions to the knowledge of the genus *Hercospora* with special reference to its type species *Hercospora tiliae* (Pers.) Fr.]—*Ann. mycol., Berl.*, xxxvi, 1, pp. 44–60, 1938.

Having detected considerable confusion in the identification of herbarium material commonly labelled *Sphaeria tiliae*, the author, on the

basis of observations and a thorough investigation of the position, shows that three Pyrenomycetes occur on lime (*Tilia*) branches in Czechoslovakia, viz., *Hercospora tiliae* (Pers.) (*S. tiliae*), with its conidial stage *Rabenhorstia tiliae*; *Melanconis desmazierii* Pet., conidial stage *Melanconium desmazierii* (B. & Br.) Sacc.; and *Diaporthe hranicensis* Pet., conidial stage *Amphicytostroma tiliae* (Sacc.) Pet. Of these only the first-named may possibly assume a parasitic character in conjunction with *Exosporium tiliae* and *Pseudomassaria chondrospora*.

Full descriptions are given of *H. tiliae*, *Melanconis desmazierii*, and *D. hranicensis*. *H. tiliae* is characterized by eutypelloid stromata, the ostioles emerging singly and rarely projecting above the stromatal apex, cylindrical, short-stalked asci with oblong or elongated-ellipsoid, frequently fusiform spores, 12 to 18 by 6 to 8 μ, average 15 by 7 μ, and numerous paraphyses. A new form of *H. tiliae*, f. *gigantea*, characterized by perithecia 450 to 600 μ in height and 300 to 400 μ in breadth (200 to 400 μ in diameter in *H. tiliae*), is also described.

LINDEGG (GIOVANNA). **Note fitopatologiche. II. Una nuova specie di 'Coryneum' su rametti di Tiglio.** [Phytopathological notes. II. A new species of *Coryneum* on *Tilia* branches.]—*Riv. Pat. veg.*, xxviii, 3–4, pp. 69–74, 1 fig., 1938.

In 1936, ten- to twelve-year old basswood [*Tilia americana*] trees at Piacenza, which for the previous two or three years had shown yellowing of a few leaves accompanied by a withering of some of the young branches, suddenly developed much more severe symptoms, including extensive yellowing, heavy leaf fall, a brown discoloration of the young shoots, and a drying-up of both young and old branches. In some cases, even the trunks showed incipient desiccation and later on succumbed. The roots were entirely healthy. The European species of *Tilia* in the vicinity were unaffected.

From livid or ash-coloured, irregular, depressed lesions surrounded by a conspicuous, dark reddish border, in the bark of the affected branches the author isolated a fungus with minute, black, erumpent acervuli, olivaceous-brown, cylindrical, pluriseptate conidiophores measuring 60 to 75 by 8 μ, and ovoid, olivaceous-brown, generally 3-septate conidia rounded at the edges, faintly constricted at the septa, and measuring 40 by 15 μ. The fungus is named *Coryneum tiliaecolum* Ferraris & Lindegg n. sp. [with a Latin diagnosis]. No inoculation experiments with the fungus are described but the author considers it to be the cause of the disease. Affected trees recovered after removal of the infected branches and two applications shortly after leaf-fall of a 4 per cent. cupric spray.

MERENDI (A.). **Il problema dei Castagneti da frutto in Toscana.** [The problem of the edible Chestnut in Tuscany.]—*Atti Accad. Georgof. Firenze*, Ser. 6, iv, pp. 41–77, 1938.

Among other problems relating to the production and utilization of edible chestnuts in Tuscany, the writer deals with the present distribution and position of the ink disease due to *Phytophthora cambivora*, and with the possibilities of arresting its further spread by the extended

cultivation of the Shiba and Tamba varieties of the Japanese chestnut (*Castanea crenata*) [*R.A.M.*, xvii, p. 356].

PETRAK (F.). **Beiträge zur Systematik und Phylogenie der Gattung Phaeocryptopus Naoumov.** [Contributions to the taxonomy and phylogeny of the genus *Phaeocryptopus* Naoumoff.]—*Ann. mycol., Berl.*, xxxvi, 1, pp. 9–26, 1938.

This is a critical discussion, supplemented by an amended generic diagnosis in German, of the taxonomy and phylogeny of Naoumoff's genus *Phaeocryptopus* (*Bull. Soc. oural. Sci. nat.*, xxxv, p. 20 extra, 1915) [cf. *Bull. Soc. mycol. Fr.*, xxx, pp. 424–425, 3 figs., 1914] represented by three species, viz., *P. nudus* (Peck) Pet. [? n. comb.], syn. *Asterina nuda* Peck (1885), *P. abietis* (Naoumoff's type), *Adelopus balsamicola* [*R.A.M.*, xvi, p. 719], and *A. nudus* [ibid., xvi, p. 356], on dying and dead needles of various *Abies* spp., especially *A. balsamea* in North America, *A. sibirica* in the U.S.S.R., and *A. alba* in Europe; *P. gaeumanni* (Rohde) Pet. [? n. comb.] (*Adelopus gaeumanni* [ibid., xvi, p. 356; xvii, p. 361], and *A. balsamicola* f. *douglasii* [ibid., xvi, p. 719]) on living and dying needles of *Pseudotsuga taxifolia* in Austria, Germany, Switzerland, and England; and *P. pinastri* (Ell. & Sacc.) Pet. [? n. comb.] (syn. *Asterina pinastri* Ell. & Sacc.) on dried needles of *Pinus rigida* in the United States.

Phaeocryptopus gaeumanni is characterized by a profuse, reticulate, more or less closely interwoven, pale grey to olive-brown, indistinctly and distantly septate mycelium, 3–5 μ thick, traversing the entire mesophyll of the infected Douglas fir needles, here and there forming small knots enclosing red to rust-coloured vestiges of the host tissues, and partially occluding the stomatal air-chambers. The obtusely conical hypostromata measure 20 to 35 μ in thickness at the site of penetration and taper downwards to an average of 9 to 15 (8 to 22) μ. The roughly circular, dull black, densely aggregated perithecia, strongly convex at the apex, sometimes irregular, very seldom slightly elongated and broadly ellipsoid, measuring 50 to 80 μ in diameter, are furnished with a membrane 13 μ in thickness, composed of two to three layers of nearly opaque, brownish-black cells, merging abruptly into the hyaline internal tissue, and contain clavate, sessile or very short-stalked, thick-walled asci, 30 to 40 by 8 to 15 μ, containing eight elongated-clavate or fusiform, straight or sometimes slightly curved, uniseptate, hyaline, bi- or triseriate ascospores, 11 to 15 by 3·5 to 5 μ. Paraphysoids are sparingly represented by a mucilaginous mass showing only a faintly fibrous structure.

From a careful examination of abundant material of the fungus in question, the writer upholds Rohde's opinion that *P. gaeumanni* is distinct from *P. nudus* [ibid., xvi, p. 356], as against that of Steiner [ibid., xvi, p. 719], who regards the former as merely a variant of the latter. This conclusion is reached mainly on the basis of marked differences between the two fungi in respect of hypostromatal development and the shape and dimensions of the perithecia.

KIMMEY (J. W.). **Susceptibility of Ribes to Cronartium ribicola in the west.**—*J. For.*, xxxvi, 3, pp. 312–320, 1938.

Tests of the susceptibility to *Cronartium ribicola* and teleutospore-

producing capacity of *Ribes* spp. [*R.A.M.*, xvii, p. 572] have been carried out over a period of 15 years in British Columbia and Oregon, involving a total of 22,046 trials on 51 *Ribes* spp. and forms. Whenever possible the experiments were conducted on naturally grown *Ribes* exposed to infection from adjacent white pines [*Pinus monticola*] producing an abundance of aecidiospores, but where this was impracticable epidemic conditions were simulated by artificial inoculations. California and southern Oregon species were transplanted in test plots within the known range of the disease to prevent the introduction of the rust into unaffected areas. The test plants of each *Ribes* sp. were classified as open, part-shade, or shade forms and the data relating to each were kept separate throughout the study. The various species and forms are listed in tabular form in order (1) of their susceptibility to infection, and (2) of their capacity for teleutospore production.

Generally speaking, the more susceptible the species or form the heavier was teleutospore production and vice versa. In most cases, within a single species, the part-shade form was the most susceptible and usually produced the largest number of teleutospores, while the open form was the most resistant and produced the fewest teleutospores. Of the species tested, *R. nigrum* was the most susceptible and produced the highest number of teleutospores, while the open form of *R. cereum* was the most resistant and yielded the fewest teleutospores. Other susceptible species included *R. klamathensi*, *R. marshallii*, *R. cruentum*, *R. binominatum*, *R. velutinum*, *R. erythrocarpum*, and the Oregon Caves variety of *R. sanguineum*, but their position in the scale can only be tentative since they were tested outside their natural range. Some degree of resistance was shown by *R. divaricatum* (open form), *R. lacustre*, *R. setosum*, *R. viscosissimum*, *R. laxiflorum*, *R. lobbii*, *R. acerifolium*, *R. americanum*, and cultivated red currants and gooseberries (unnamed). Occasional infections were found on the fruits and floral bracts of *R. sanguineum*, while teleutospores have been observed on the peduncles of *R. lacustre* and *R. sanguineum* and on the rachides of *R. petiolare*. No infection resulted from the inoculation of bud scales and unopened buds of *R. lacustre*, *R. petiolare*, and *R. viscosissimum* with aecidiospores of *C. ribicola*.

MANDENBERG (E. C.). **History of blister-rust control in Michigan.**—*Pap. Mich. Acad. Sci.*, xxiii, pp. 311–318, 1938.

This is a detailed survey of work carried out under a co-operative control scheme against white pine blister rust [*Cronartium ribicola*: see preceding abstract] in Michigan before and after the enactment of the State blister rust control law [*R.A.M.*, ix, p. 8]. The history of the occurrence of the disease in Michigan is given, and the control measures, comprising pre-eradication survey of all white pine stands in the autumn and winter, eradication of all *Ribes* spp. under white pine and within a 900 ft. zone round the stands, and nursery sanitation, are described. A list of the *Ribes* spp. found is given and stress laid on the eradication of *R. nigrum*, the cultivated black currant, which is highly susceptible to the rust and particularly dangerous in the long-distance spread of infection.

GOBIET (M.). **Les causes du dépérissement du Mélèze d'Europe.** [The causes of the failure of European Larch.]—*Bull. Soc. for. Belg.*, xlv, 4–5, pp. 191–202, 1938.

After pointing out that the European larch has proved a failure in Belgium, and that it is being replaced by Japanese varieties which lack the height and other desirable qualities of the former, the author states that the failure of the trees has been due to insect and fungal diseases, chiefly canker. He takes the view that canker is brought about mainly by frost injury, not primarily by *Dasyscypha calycina* [*D. willkommii*: *R.A.M.*, xiii, p. 482; xv, p. 618; xvii, p. 360]. Recent work on the disease in various countries is reviewed and discussed, and the conclusion is reached that the solution of the problem in Belgium is to select varieties of the European larch suitable for the local climatic conditions of the districts in which they are to be planted.

BUCHWALD (N. F.). **Steril gulvlægning.** [Sterile floor-laying.]—*Dansk Skovforen. Tidsskr.*, xxii, pp. 260–265, 1937. [Received July, 1938.]

Of late years there is stated to have been an alarming increase of fungal rotting in new buildings in Denmark, due in part to the use of insufficiently dried timber for constructional purposes and partly to the extensive replacement of the old-fashioned stoves by central heating, which has not the same drying effect. Formerly *Merulius lacrymans* was the chief agent of dry rot—and still is in old houses—but it has been largely superseded in modern buildings by *Paxillus acheruntius* [*P. panuoides*: *R.A.M.*, xvi, p. 789], first recorded in Denmark in 1918, and *Coniophora cerebella* [*C. puteana*: ibid., xvii, pp. 424, 496 *et passim*]. Control may be effected by flaming all the flooring boards, joists, and the like, with a blow-lamp to destroy the fungal spores, followed by the application of a disinfectant to prevent any subsequent development of the organisms. Cuprinol [ibid., xv, p. 413] may be applied to beams but its strong odour disqualifies it for indoor treatments, which should be made with 4 per cent. copper sulphate or Bordeaux mixture, or better still with antinonnin [ibid., xiii, pp. 414, 486], if procurable.

Legislative and administrative measures.—*Int. Bull. Pl. Prot.*, xii, 4, pp. 81–83, 1938.

Kenya (Colony and Protectorate of). By Ordinance No. XXIV of 1937, dated 28th August, 1937, which may be cited as the Plant Protection Ordinance, 1937 [cf. *R.A.M.*, xvii, p. 208], the Governor in Council is empowered to make rules for the purpose of preventing or eliminating diseases in the Colony. Government Notice No. 687 of 2nd September, 1937, declares the following to be diseases within the meaning of this Ordinance: Elgon die-back [of coffee], *Hemileia vastatrix* [on coffee], *Nematospora coryli*, *Bacterium tumefaciens*, *Corticium salmonicolor*, sugar-cane mosaic and streak, *Bact. rubrilineans* [on sugar-cane], *Sorosporium reilianum* [on sorghum], *Bact. malvacearum* [on cotton], lily mosaic, *Spongospora subterranea* [on potato], potato mosaic, crinkle, and streak, *Bact. translucens* var. *undulosum* [on wheat: ibid., xvii, p. 384], and groundnut rosette [see above, p. 582].